

American Railroad Journal.

WHOLE No. 2,560.]

NEW YORK, JANUARY, 1885.

[VOLUME LVIII.—No. 10.]

RAILWAY STATION ARCHITECTURE.

BY CHEMIN DE FER.

[Written for the AMERICAN RAILROAD JOURNAL.]

IN a recent number of the JOURNAL I discoursed briefly upon the subject of railway art, urging upon railway managers in general a closer attention to the eternal fitness of things in the principles of decoration than is ordinarily paid. Incidentally I touched upon the subject of the construction and appearance of railway stations as being germane to the topic under discussion, but purposely avoided an extended comment thereon, for the reason that the subject of railway station architecture is of sufficient importance to merit a discourse of its own.

Imprimis it may be stated that a railway station is a necessity, and therefore its construction should be commenced with the idea of utility most prominent in view. Whether the station be an enormous and palatial structure at the terminus of a trunk line in some great city, or whether it be but an humble little shed at some country hamlet, if it is built for use, and whatever of luxury there may be about it must be the luxury of usefulness. But nevertheless in the architecture of railway stations it must be borne in mind that the principles of true art demand consideration. In a city the railway station should be essentially a city building, in character with the buildings surrounding it. Philadelphians are rather proud of the new Pennsylvania station on Broad street, and the Pennsylvania road has probably found the expenditure of the money necessary to construct it a profitable investment; but had the road constructed a barn-like building on their commanding site, fronting in all its rusticity the towering pile of marble forming the municipal building, it is highly probable that the sensitive Philadelphians would have loudly rebelled at such desecration. To a great extent a railway is under obligations to a city, and the construction of buildings that are eyesores is manifestly improper, to say little of its being poor policy. For a like reason a country station should be in thorough harmony with its surroundings. There are many outlying towns on the line of railways, where city people have constructed cottages and villas for summer residences, and a most depressing sight is frequently presented at one of these towns, in the shape of a contemptible little shed serving the purpose of a railway station. It is not uncommon, on the other hand, for railways to select eligible points along their lines where there is not a single residence in sight, give them attractive titles, parcel out the land in building sites and erect charming little stations surrounded by flower-beds and gravel walks, trusting to the attractiveness of the spots for the growth of towns and the consequent increase of travel. With scarcely an exception this reliance on an outcome of the future is justly based, and within a

radius of fifty miles from New York City there are as many pretty little towns owing their existence to railway enterprise in this direction, and I maintain that the artistic railway station is the chief bait for the railways to hold out. The city traveler, reading his paper or dozing in his comfortable seat, is not likely to view the surrounding territory while the train is whirling him to his destination, especially if he be accustomed to travel; but instinctively he will gaze out of the car-window at every station if the road be not one upon which he frequently travels. The first thing he looks upon is the railway station, and here is where the first impression is apt to be lasting. If the station belong to the first-named class of dismal, dirty little boxes, surrounded by mud and ashes, he will turn wearily away, and no amount of after persuasion will convince him that a town whose access is obtainable through the miserable little station in question has any charms in compensation. But with an eye attracted by a tasteful little Queen Anne cottage, peeping out from a mass of refreshing and many-hued foliage, he is quite ready to believe that the whole town is a most delightful spot, and is even prepared to wager that the water thereof is of excellent quality and the sanitation perfect, without sampling the one or inspecting the other. Such are first impressions and such is unreasoning man.

It may be said with truth that no railway company is justified in going to the expense necessary to equip all the towns along their lines with stations coming up to the requirements demanded by the true artist, but if economy must be practiced, for heaven's sake let it be practiced in the quantity and not the quality. Many railway stations are much larger than the occasion demands, and appear to be built with reference not so much to present requirements as to the needs of a future generation. In every respect a small station is better adapted for a small town, than a disproportionately large one, difficult to keep in good order, and lacking the appearance of snugness which is a great charm. The cost of construction of a small station tastefully arranged, and with an eye to economy of space, would be no greater than that of the ordinary shed which too frequently mars a railway landscape.

Regarding the interior of railway stations, comfort and convenience to patrons are the most essential considerations. The ventilation should be thorough and effective, and the sanitary arrangements subjected to careful attention. There should be a plentiful supply of water both for drinking and sewerage purposes, and the drainage should be kept free from obstruction. In Winter the heating should be accomplished without roasting the waiting passengers, and the temperature kept as close as possible to the ordinary temperature of the cars. Architecturally the decoration of the interior of railway stations should be suggestive of comfort and utility, and fortunately these can be obtained with but slight cost. A separate waiting-

room for women should always be provided, if it be but large enough to swing a cat in and a small cat at that, for though a railway station is but a temporary abode, albeit it is sometimes a haven of refuge.

In connection with the general architecture of railway stations a few words may be said as to the construction and arrangement of the adjoining platforms. Fortunately for mankind the raised platform, level with the steps of the cars, is fast going out of existence, its disappearance in some instances accelerated by State laws. This style of platform is properly regarded as a death-trap, and the perilous gap between the cars and the planking has been the cause of more than one fatal disaster. Experience has demonstrated that a platform flush with the rails is by far the safest, and if the platform be narrow, allowing but a short distance from the station to the cars, it would be well if the floor of the station were also on a level with the platform, thus avoiding the necessity for ascent or descent which in slippery weather might be attended with disastrous results.

To a great extent whatever may be said with reference to passenger-cars as bearing upon the comfort of the traveler, may also be said about railway stations, for I take it that they are in a certain sense stationary cars, answering a similar purpose to that of the railway vehicle. The architecture of stations affords an interesting study for the architect and also for the railway manager, and is properly receiving more attention than formerly; but differing from the passenger-car, there is more room for the artist than for the mechanic, and a greater scope for originality and variety. Bearing in mind the absolute requirements of a station, the architect has a wonderful chance to beautify the scenery of a road, and the more unattractive the general features of the surrounding country the better will his efforts be appreciated.

A TRIP OVER THE NEW YORK CENTRAL AND LAKE SHORE TO CHICAGO.

BY CHARLES H. E. REDDING.

[Written for the American Railroad Journal.]

THERE is a little anecdote related of Corning, I think, when he was potent in Central management. He believed in allowing the greatest latitude of action to his subordinates, provided always, such action was in the line of his desires. There was once a question of the color of cars. Both Corning and the master car-painter held decided views. It is said that Corning told the painter that it was his wish that there should be the completest liberty in such matters, ending with, "Now, Mr. Painter, there are your cars; go ahead and paint 'em any — color you please, so long as you paint 'em red!" The Central magnates of to-day are willing to allow the traveling public an equal liberty of choice as to routes to the West. Go West, they say, by any route you may prefer so long as you go *via* the New York Central and Hudson River Railroad. There was a time not so remote as to have been obliterated from the memory of the present generation of the traveling public, when Central was not over-nice in the accommodations provided for first-class travel. The more emphatic and choleric were wont to stigmatize the rolling-stock in most unseemly language, and it is an

undoubted fact that the management made enemies with undesirable facility. Perhaps it was due to a change of heart, peradventure it was active competition, but whatever the compelling motive, the excellent fact is vividly apparent that to-day the wayfarer is treated nicely, there is a perfectly patent solicitude for his comfort and convenience, and some apostle of good manners has labored with the servants of the road, bringing forth the pleasing fruit of civility, courtesy, and an endeavor to make themselves useful to passengers.

Recently the writer, through the courtesy of the officers of the Central and Lake Shore roads, made the trip to Chicago for the express purpose of noting such changes and improvements as should fall under his notice.

The start was made under repellent conditions. It was intensely cold. The train was a heavy one, made up of a string of ponderous sleepers, with day coach and smoker. With favorable weather it would have been a heavy load, requiring a stout engine to pull it through on the fast time scheduled for the train, yet, in the whole distance between New York and Buffalo, only forty-five minutes were lost, and Chicago was reached strictly on time. Considering the difficulties of railway service when there is a blizzard constantly in front of you, it speaks well for the motive power and management that such should be the case.

The Wagner cars that, erstwhile, were not perfection on wheels, have also responded to the note of progress, and are now not only artistic in their internal fittings, but what is more important, extremely comfortable. They seem to be hung up and adjusted on their springs more perfectly, as they ride much easier. This is not due entirely to excellence of road-bed, as the Central and Lake Shore have, at all times, been particular, in this regard to the minutest details; hence it is clearly just to ascribe an improvement to the Wagners, with due credit.

The day coaches of both roads have, likewise, felt the influence of the master car-builder, as shown by cars of an improved design. Both roads supply cars with greater window space, a better proportion of the clear-story, roomier and better upholstered seats and a general interior effect of roominess and light that is most pleasing. A very desirable feature is the end ventilation of the cars, whereby a supply of fresh air may be admitted without creating draught, at the same time securing a circulation of air that is, more than any other one feature, least scientifically looked after on most roads. The notion that vitiated air will pass out, and cold air flow in simultaneously, through side ventilators, while a train is in motion, may be theoretically correct; but it is a mournful fact that it does not work in practice to the satisfaction of passengers. Entering the cars of either of these roads from the clear air outside, one is not sickened with that stale, second-hand atmosphere that has done duty several times. It is no economy to breathe the same air more than once, when one considers that the atmosphere surrounding the earth is forty miles deep; and it is decidedly unpleasant.

A very important point to be considered by the through passenger, is the fact that all connections are made in union stations, and luggage receives less than the usual rough usage, as it, also, is placed in a through baggage-car in New York or Chicago, and bulk is not broken, either way, until final destination is reached. The merciful man is merciful to his trunk, and he is glad to see it restored to him not indistinguishably battered.

Under the most favoring circumstances, a ride of a thousand miles is not without monotony, but I know of few more interesting rides than the journey over the Central and Lake Shore. The Mohawk Valley is not "grand," but it is certainly picturesque and full of historic interest. Besides no two roads in the country pass through so many large towns and cities, so that one's attention is constantly alert and occupied. The local travel on both roads is really large, and there is all the amusement of seeing your fellow man as "others see him," until you finally reach your journey's end in a pleasant frame of mind due to the incidents of the trip, the comfort of the conveyance, the thoroughness of the management that has catered to your comfort, the excellence of the dining-halls, and the politeness of the officials.

ATTENTION TO DETAILS IN RAILWAY TRAVEL.

BY MARVIN C. WILLIAMS.

[Written for the AMERICAN RAILROAD JOURNAL.]

It is probably safe to say that whoever has bought and used a ticket on any of our railway lines has in one way or another, been forcibly struck with the lack of attention on the part of the companies to the smaller details and less noticeable points of comfort in the management and system of their respective lines. There are companies who give every evidence of an entire readiness to run and manage their roads on the most liberal basis. There is no sign of any effort to economize or save money in any department, however apparently insignificant. On the contrary in some instances there is a lavishness and display of ornamentation and embellishment that would seem to indicate an absolutely reckless expenditure in a direction wherein it is difficult to see that the investment could in any way be justified by an expectation of a fair return. But it is in this ornament and decoration that the principal so-called improvements are made. Coaches of an ordinary way accommodation are with us far handsomer and more luxurious than the special private carriages dedicated to the sacred use of the crowned heads of the various countries of Europe. They abound in a profusion of mirrors, carving, painting and solid woods. The light fixtures are in the latest and most approved artistic forms of brass and copper, while even the hand-rails of the platforms are nickel-plated. Gas is burnt in the lamps, and it is even possible for travelers to read by its light after night-fall, whereas in other countries, failing daylight, the unfortunate occupant of a compartment must rely on his memory for literary recollections, or be content to do without entertainment of that nature.

Compared with other countries, we are, it is true, infinitely in advance in both the ornamental and comfortable features of travel. What would an American, accustomed to travel on our roads with their varied conveniences and advantages, think of being thrust into a small space with two benches facing each other, and knees touching; the weather biting cold, and the only palliation of the latter a small flat leaden can filled with warm water, which in the course of half an hour becomes an admirable refrigerator, but could be of little use for any other purpose; and the window glasses begrimed with filth, showing indisputable evidence of not having enjoyed the luxury of ablutions

since they were first put in use, saving and excepting such involuntary washing as heaven might have seen fit to bestow in the form of rain. Compartments on European railway carriages are used one day for smokers, and on the next for ladies only, without any intervening renovation, with the result of a general collection of ashes, burnt matches, and half-burnt cigars and cigarettes on the floor.

This may be far from pleasant, and it is true, far behind the arrangements securing cleanliness and neatness with which we meet on our continent, but we are still by no means where we should be, especially in the question of what may be termed small comforts. No one will for an instant deny that it is very pleasant, while being whirled through a beautiful or interesting section of our continent to be comfortably seated in a coach belonging to one of our "crack" lines, surrounded by all that is beautiful and artistic, the windows of the finest and clearest plate glass, and reclining on a seat of softest plush, one's feet outstretched upon a handsome mat or carpet. But in Summer the advantages of the French plate window are more than over-weighted by the fact that under no inducement can it be persuaded to permit itself to be raised, and in the parlor-car in Winter the softest and most charming mats or carpets by no means balance the intolerable discomfort of having one's feet in an ice bath, and one's head in a Turkish ditto. Again in passing through a beautiful or historic section of country where local names call up recollections of well-known scenes and incidents, much of the satisfaction and gratification which might otherwise be obtained is ruthlessly destroyed and blotted out by the hopelessly unintelligible howl of some brakeman, on whom the traveler had been relying for his information as to the nomenclature of the various stopping places along the route, and by the subsequent maddening mental exercise of endeavoring to apply some translation to the barbaric conjunction of sounds apparently intended to signify some station.

The courtesy or rudeness of a conductor, may, when viewed philosophically, be but a matter of trifling import, but it is by no means easy to keep the temper placid and unruffled under the unjustifiable impertinence of some train monarch, and the enjoyment of an entire trip may readily be wiped out, and the milk of human kindness turned to gall, by a discourteous and disobliging answer to some simple question.

A civil and pleasant conductor and train-crew could render a regular evening train of cattle-cars far more popular with the patrons of the road, than would be possible with men of a reverse disposition in a line of Pullman coaches, replete and overflowing with every known and unknown luxury of modern railroading. There is nothing that so much contributes to the reputation and popularity of a railway as the courtesy of its and the public servants. Travelers would not hesitate an instant between plain courtesy and magnificent insolence.

These specially enumerated elements of popularity are within the reach of all roads, and above all are a mere question of discipline, not involving an extravagant outlay of money, as in the case where mere beauty and artistic finish is relied upon to make a name for a road. A traveler has an indisputable right to expect a courteous demeanor and treatment on the part of the men whose salaries he pays, but seldom does he obtain it. It

seems almost incredible to the individual when he meets with some conductional insolence, and futilely lodges his customary complaint, that the road should blindly neglect so very obvious an element of success and popularity; yet so it is.

The features of railway travel which really most conduce to personal comfort, are those which do not demand any special outlay on the part of the company, but simple rigid rules, which should be absolutely enforced, demanding that its servants should treat those under their care as what they truly are, their masters and employers, and give them that respect and attention to comfort which is due to their relative position.

It is in the smaller points, such as are enumerated, that a wise management could, with a perfect economy, make its road justly popular. Clean cars, courteous servants, equable temperature and a general attention to the smaller details of travel, would render a poorly-equipped line to another neglecting these most salient features, a truly formidable competitor.

THE PAINTING OF PASSENGER-CARS—LIGHT VS. DARK COLORS.

BY R. MC KEON.

[A Paper read before the Master Car-Painters' Convention, Boston, Mass.]

THE manufacture of railway cars is a great and growing industry, and as the increase in mileage goes on the demand becomes greater. We therefore see the importance that attaches to passenger-car building, as well as to the general repairs of all classes of cars in our railway shops, and which requires that each department of the work be placed under the supervision of practical men who have acquired a knowledge of their trade in the car-shop, and are well acquainted with all the details of the construction and finish of cars. Each of the several departments calls for mechanical ability and good management on the part of those in charge, so that a system of working may be followed that shall produce the best results with the least expense.

The painting of railway cars is progressive, and to-day commands equal attention with the other departments whose duty it is to care for the rolling-stock of the road, and progress is expected to be made by those who are intrusted with the supervision of the paint-shop. We are not merely to follow in the wake of those who may have gained some little notoriety for their success in work and management, but we should reach out in search of improvement, our aim being to make some progress in the art. The painting of a first-class passenger-car is of more importance than many of our railway officials may at first thought imagine; at least it would seem to be so from the fact that it is frequently the case that the time taken to paint a car is considered as so much loss of service of the car to the company, when a little investigation would convince them of the necessity of proper time being allowed to do the painting, which, when done, would be alike creditable to the road and to the shop.

Cars are painted not only to add to their beauty and attraction—two important points in painting—but are painted for their preservation. The appearance of a car plays a very important part in the traffic of a road. Many of our Western lines have built up their reputation on the

interior finish and decoration of their cars, as well as in the good taste shown on the outside painting; for let a car be devoid of beauty and faulty in design, or bad taste be exhibited in its finish, and it is not suitable for the place it was intended to fill. It is, therefore, a wise policy for railway companies to show a reasonable amount of pride, and the paint-shop is one of the places in which to study out the tastes of the traveler, and to blend together in harmony the colors and designs which will please the eye and command the approval and the patronage of the public. But how shall we economize in car painting? That is a very important question, and, in fact, is the leading question of the day, not alone in the paint-shop, but in all other departments engaged in the building and repairs of cars, and it will be our object at this time to show the management of our roads how to save expense on the passenger-car painting by referring them to practical tests, together with an experience of one-third of a century in the railway paint-shop.

During the past fifteen years a considerable reduction has been made in the cost of painting, and the credit, we think, is in a large measure due to the labors of the Master Car-Painters' Association, who will continue their efforts to further reduce the cost of work and to show where economy may be introduced without detracting from the wearing qualities or the durability of the painting. The color of passenger-cars for some years has been hard to decide. No fixed standard has given entire satisfaction, and numerous changes have been made. I know of roads that have had four different standards of color in the past twelve years, but they were all of a dark shade. The consequence is that very few roads have their cars all of a color, which does not show very good taste, and certainly not good judgment on the part of those who had the power to make the changes. Therefore we think that a uniform standard of color on all passenger-train cars of a road would be the most important step ever taken towards economy. I am decidedly in favor of light shades of color for passenger-cars. A long experience in their use has convinced me that it is economy to use white lead for a finish. It is true that dark colors have been popular of late years, so much so that many hesitate to advocate what they know to be the best for wear, but we should not be tied down to any standard of color or method of working when we are convinced that it is not producing good results. We must seek for something better, embracing every opportunity to add to our knowledge of the pigments employed, for unless we exhibit such an interest in our labors we are not fulfilling the entire duty we owe to those who employ us. There are too many men who fail to advocate economy and who follow the method that is indorsed by some leading road or shop, in place of showing in their work by practical facts what benefits would be gained by making a change in the methods employed, and, instead of adopting a standard of color at the simple suggestion of some road official, first take into consideration the value of such color, its adaptability to the work and whether it would be for the interest of the road to adopt it, when a plain statement might be made setting forth their objections to the pigment or color proposed to be used.

The painting is about one-twelfth the cost of a first-class day coach, which includes labor and stock, and must be renewed from time to time; and being a protection to

all other parts of the work, it must be watched carefully and treated at the proper time, or we not only destroy the painting and the decoration, but neglect will ruin the entire finish. Twenty-five years ago, and later, most of the passenger-train cars of our principal roads were painted a light color—yellows of different shades being generally used. White lead was the foundation and the finish of the car, and lead in those days was manufactured honestly; it was not thrown on the market half corroded and poorly ground in cheap adulterated oils, as we find it to-day in many places (although I am glad to learn, from those more fortunate than myself, that a few reliable manufacturers still exist). But a change came in the color of cars, and changes are not always beneficial; competition brought out new colors, anything for attraction, and a ground work was introduced for the sole object of setting off the decoration on the outside of the car to greater advantage. Economy was not thought of; it was a matter of less importance in those days than now; but a change was made from the straw colors to the umbers or darker shades, which involved an expense of one-third more in the first cost of painting, while the life and service of the car was one-third less than it had been with the light colors.

We do not attribute all the saving in expense to the use of light colors, but just as soon as a change is made from a lead finish to any of the popular shades, such as umber brown, chocolate, Pullman color, olive and Quaker green, Tuscan red, or, in fact, any color where no lead enters into the mixture, then we lose at once the wearing quality, for it is the exposed surface of a paint that tells. This is the protection to the entire body, and a lead foundation will not help the finishing color if composed of the pigments we have named, but carry the lead all through and we have a durable surface, we have a car painted that will pay for the labor expended on it, and we wish the companies we represent here to-day might be convinced of the facts of our argument in favor of straw color on their passenger-cars, which is the first step toward economy in the painting department of their road. We can show them that this is where a great saving might be made, and with more care in the purchase of paint stock, we can assure them that they would have more cheerful and attractive cars in place of the dingy, dull and lifeless ones which now confront the traveler in many of our railway depots, and the varnish on such colors would also retain a luster much longer and do better service by having the lead finish for a foundation.

While speaking of the superiority of a pure white lead over all other pigments, I would state that no other pigment bears more oil; it is of itself an oily nature; therefore pure linseed oil combines with it better than with any of the vegetable or earth pigments. No one will dispute the fact so well known to all painters, that a lead pigment is more durable and forms a denser coating than any other employed in the paint-shop. A solid body, and one that has depth to it, is the main object in a paint; this guarantees durability. A coat of Tuscan red may have coloring-matter sufficient to cover the work, but that is simply a stain; there is no wear in it; but lead gives a solid foundation, and will hold out the varnish well on its surface. Being less porous or spongy than other pigments, it acts as a protector, for varnish does not decay altogether on the exposed surface; the absorption under it which takes place in all vegetable and earth paints, as well as in chemi-

cal productions more than in lead, draws the oil as much perhaps as light and air does on the surface.

Heat is the great enemy of paint, and such colors as are in general use on passenger-cars draw the sun's heat, which burns the oil and the life out of the varnish and paint. By repeated tests of light and dark colors, we find that white presents the coolest surface in a hot sun, and black the hottest. A gradual scale may be run up, and the heat-absorbing power increases as the colors become darker, the effect being to expand and soften the darker colors. A continual heat would make the paint and varnish elastic, and while in this state, were it suddenly exposed to cold air, the contraction would crack the painted surface; but take a light color and put it to the same test, and we find that it does not draw nearly the same amount of heat, nor a sufficient quantity to soften the paint and varnish.

I know that it is argued that our railway managers prefer the colors they use, and we should, therefore, try to make them as durable as possible. We would not for a moment deny them the right to their choice of color, and we have always labored to secure the best results, but the experience many of us have had with such fugitive colors is far from satisfactory. We can say for light color that it has less absorbing power, hence its durability and less liability to injury by solar heat, as dark shades, or the reds which are so common on coaches the last few years, and which suck in the heat and moisture, making but feeble resistance to the attack of storm and cinders, having no solid body to resist the sudden changes of weather. Why, then, persist in the use of pigments that are so easily destroyed, or rendered lifeless and dead by constant exposure? But I am aware that some claim the heat theory to be only imaginary, and therefore I do not advance these arguments in favor of light colors simply from my own experience, but I have the practical views and experience of car-painters in various parts of the country, and the large majority tell me that the life of a dark color on a car, particularly in the Southern States, is less than half what a buff or straw color is. The dark color in one case referred to is of an olive shade, which I am informed the heat soon changes to a deep black olive, and frequently the dark cars have to be repainted after only twelve months of service, the paint being too far gone to revarnish, while the buff-colored cars run from eighteen months to two years, and then clean up well and are revarnished.

What shades of color suitable for cars will resist the deadening effects of solar heat the best? We have the various shades of straw, lemon, cream, deep gold, old gold and buff. Many shades may be made between a pure white and an orange, in all of which white lead predominates, and the best brands of chrome yellow and yellow-ocher with venetian red. No shade of color should have the strong yellow cast that we have seen on some roads; it should always be toned down, which enriches it. These colors will outwear any of the dark colors or reds now in use fully one-half, or in other words, a car painted yellow will do good service, when first painted, for eighteen months before requiring to be revarnished, while the dark or red colors will last but twelve months at the most.

Light colors retain the oil a greater length of time; and that dark colors absorb and retain heat has been proved by numerous tests. If lampblack and white lead be

placed side by side, the absorbing power of the black is 100, while that of the lead is only 53, the reflecting power of the lead being 47. Cloth of different colors placed on newly fallen snow also shows that the white is the last to melt the snow.

In mixing car colors of a light shade, or straw colors, we find that a pure white lead is first necessary, which should be tinted with the best French ochre and English chrome yellow. This will make the most durable color for car-bodies; the chrome is permanent when mixed with lead, almost as much so as the best ochres, but it is far superior in body and covering properties, and one of the most useful pigments in the paint-shop. White lead alone will change from its original whiteness in case it is mixed with a surplus of oil; it is the oil which changes it to a yellow cast as it hardens in drying; but when lead is mixed with some other strong pigment, its color when thus tinted is more permanent, and its density and wearing qualities are increased. The durability of a color we do not claim to be altogether in the pigment employed, but it is equally so in the vehicles used in its preparation for use; therefore lead, which is known to retain oil the best, will hold the color longer.

Painting is put to the severest test on our passenger-cars, and its destruction is caused by a constant exposure to the elements and the changes of atmosphere, from a dry, burning heat through the day to a heavy moisture at night, which the painted surface absorbs in large quantities, to be dried out again, the same process going on day after day. But perhaps it is, as I have heard expressed by members, that the foreman painter is not consulted in regard to the color of the car. This is generally decided by those who know nothing of the adaptability of a paint to the work. Freaks of fancy have too often determined what the color of the car should be, with no thought given or questions asked of those who are expected to know the difference in the lasting qualities of a color, nor is the question considered whether a color would wear six or twelve months. Would it not, therefore, be economy to ascertain what amount of wear is in a color before it is finally adopted as the standard of the road?

Our arguments in favor of the light colors probably will not change the views of the officers of our roads. They may, however, find the matter worthy of their attention, and, to test it for themselves have one coach painted any light shade, and put it in service along with a car painted Pullman color or Tuscan red, when twelve months' service will prove what I have already asserted, that light colors are the first step toward economy in the car-painting department of a road.

THE DANGERS THREATENING RAILWAYS.

MOST of the difficulties that have surrounded the railways in the past may be attributed either to causes inherent in the system or to the irregularities of those that have secured temporary control of them. The embarrassments with which they will have to contend in the future, it appears to me, will be of a somewhat different nature, though to a certain extent growing out of past evils. Some of these may be stated as follows:

First. The burden of unproductive branches that they have acquired by lease, purchase or construction, which do not earn enough to pay their fixed charges.

Second. Oppressive legislation. If any one doubts that there is danger from this source, let him examine the calendar of any of our State legislative bodies after they have been in session a few weeks, and note the number of bills that are hostile to the interests of railways. Each member appears to regard it as a solemn duty to his constituents to introduce at least one bill of this character during a session; and the extent to which this warfare has been carried on does not argue well for the future.

Third. The hostility of the press, which, in its strife for popularity with producers, shippers, and politicians, evinces a disposition to magnify every little evil in the system, and ridicule every effort in the direction of reform, by which course it practically encourages the communistic tendencies of the age. In the discussion of the difficult problem of railway transportation, which has been carried on through the press during the past fifteen years, the railways have not been allowed a fair presentation of their case; and even in courts of justice they have had to encounter much judicial prejudice engendered by the press in its uncandid statements of fact. The railway papers have striven faithfully to overcome the prejudices excited against the great interest they represent; but the general public do not read these papers, and therefore their efforts, read only by the railway officials, are like sermons to the converted.

A statement, published in the last number of *Poor's Manual*, does great injustice to the railway interest of the country. It says that "Stocks and bonds to the amount of \$530,132,000 were listed at the New York stock exchange in 1883, * * * equivalent to about \$80,000 per mile of new road built during the year." And then it adds, by way of explanation, "A considerable amount, however, of the securities listed was on account of old works." After explaining how so large an amount came to be listed, and what a large portion it really represented, the *Manual* proceeds to say: "It is in this immense increase of fictitious capital that is to be found the cause of the general distrust which prevails." The simple fact is, that the amount of bonds listed in any one year bears no relation whatever to the number of miles of road constructed during that year. An editorial was published in the *Chicago Evening Journal* a few weeks since, founded upon Mr. Poor's statement of the cost of the roads of this country, from which the following is an extract: "If the roads had cost only what it would cost now to build them, only one-half as much net earnings would be required to pay interest and dividend charges, and their rates for passengers and freight might be reduced in proportion."

While it is true that many items that enter into the cost of construction of a railway are to-day lower in price than they were a few years since, nothing like the reduction implied has taken place. If the remark applies at all, it would only apply to such lines as were constructed between 1869 and 1873. Many of the older lines could not be duplicated for double the sum they cost, and these constitute a large portion of the mileage of the country. But in this statement the writer entirely ignores a most important fact, viz., that the railways for the most part are not able, and do not attempt, on the basis of the present tariff, to pay any dividend or interest on a very large portion of the nominal capital referred to by Mr. Poor, and could not if they wished. Transportation charges are not based upon cost or value of road, but upon cost of

carrying, and are regulated by that inexorable law of trade known as competition.

Fourth. Increase of freight earnings, with a disproportionate increase in tonnage moved, showing that a larger amount of freight is being carried at lower rates. This is a noticeable feature in the annual reports of many of our large railways, published during the past three years, and indicates a general shrinkage in rates.

Fifth. The increase of operation expenses disproportionate to that of gross earnings, shows that the additional business is done without profit; or in other words it shows that the operating expenses have been brought down as low as possible. Forces have been reduced wherever it was practicable to do so; but until some reduction can be effected in the prices of labor (and this I believe to be inevitable, despite the promise of protection), no marked decrease in the percentage of operation expenses can be looked for.

Sixth. The clamorous and unreasonable demands of shippers, both as to rates and facilities, the extent of which can only be known to those that come more directly in contact with this class, whose claims are often presented with a degree of persistence and selfishness that places them beyond the pale of reason.

Seventh. The attitude of the railways toward one another, even in cases where their interests appear to be identical; as shown by the want of unanimity among their chief officials, and by insincerity in making, and faithlessness in keeping agreements; in winking at the trickery of subordinates, in cutting rates, in overloading cars, in under-billing weight, in paying rebates, and in making time contracts. "You have not kept your agreement to maintain rates, and have been getting more than your share of business," said one freight agent to another. "Oh, well," was the reply, "you keep the agreement, and I will keep the business."

Eighth. A foolish and unnecessary rivalry between the principal competing lines, resulting in a needless and continuous decrease in rates, and a consequent reduction in net income.

Ninth. Increased and indiscriminate issue of free passes. Even that class of passes known as "annuals," which were originally exchanged as a matter of courtesy, have proved an excessive annoyance to the officers issuing them, who would gladly discontinue an evil that they are powerless even to check.

Tenth. Popular prejudice against pools, concerning which there appears to be a great misapprehension in the public mind, though for protecting the interest of both shipper and railway alike, the plan seems to be the only feasible one. It does not, as many suppose, encourage extortion, nor does it countenance discrimination, but serves as a protection and as an equalizing power in the interest of both shipper and railway.

No one who has watched the course of events can have failed to observe that a marked disintegration in railway property has been going on during the past five years. Nor can it be doubted that, if the present condition of affairs is allowed to continue, a crisis is imminent. Many of the lines whose shares may now be classed as purely speculative, have already practically passed beyond the control of their managers. With others, the status of their ownership is so vague and indefinite that they appear to be rapidly approaching that condition. Certain others,

though not experiencing actual embarrassment, are warned by the signs of the times of the necessity of retrenchment. In contrast with these, the prudently managed lines that have husbanded their resources in the past, stand out in bold comparison, and view (but not without anxiety) approaching events. But the railway system of the country, divested of its fictions and fungus growths, and guarded by a higher standard of morality, will, I believe, again shine out with renewed splendor, and, under a new and more stable order of things, will pursue the even tenor of its way in working out the grand problem for which it was designed.—[William K. Ackerman in *North American Review*.

CANALS VERSUS RAILWAYS.

THE idea that a system of canals can ever be worked profitably in opposition to railway transportation, is one that universal experience should have dissipated long before the present day. The results in England and on the Continent have been conclusive on the subject of the impossibility of canals being maintained and worked at a profit in the face of active railway competition. But if further proof were needed on the subject, we have only to turn to the United States, where canal transportation has been established and developed under circumstances most favorable for success. With an unrivaled chain of inland water communication, only requiring comparatively short links of connection to traverse the country in all directions, and with State aid given in the most lavish manner for their construction and maintenance, the history of American canals is almost an unbroken story of failures and disappointment. In a volume of Congress reports on the "Agencies of Transportation in the United States," recently issued, full details are given of every canal enterprise in the country, and some of the facts are especially interesting in connection with the effort now being made to sink a vast amount of capital in the construction of the Manchester Ship Canal. The summary given in the report is as follows:—

"The name of General Washington appears conspicuously among those who were early impressed with the necessity of providing a system of internal improvement that would unite the various points of an extended country, and bid them together in the interests of commerce. This system, in which he was a prominent prime mover, grew to a considerable magnitude, and, long after the introduction of the locomotive, there were those who looked upon the canal as the great highway of future traffic. Few are aware of the magnitude of the works that were planned and executed between the years 1825 and 1840.

"Adding together the totals of operating and abandoned canals, we have a grand total of 4,468 miles of canals, costing approximately \$214,041,802. Of these, 1,953 miles are now abandoned, and a large portion of the remaining 2,515 is not paying expenses. This is largely due to railroad competition. All the canals in the New England States are abandoned for commercial purposes. The Middlesex Canal was, perhaps, the most successful up to the time of the construction of the Boston & Lowell Railroad in 1835, and it paid expenses and a dividend of about 6 per cent. for a number of years. The Oxford & Cumberland Canal, costing a moderate amount, did a fair business previous to the construction of the Portland & Ogdensburg Railroad.

The Blackstone Canal in Massachusetts and Rhode Island, passing through a rich region of country abounding in manufactories, was built in the best manner, but was never profitable. The Farmington and Hampshire and Hampden Canals sunk \$1,089,425. In New York State, 356 miles of lateral canals, costing \$10,235,314, have been abandoned; in Pennsylvania 477 miles are abandoned, costing \$12,745,780; in Ohio, 205 miles, costing \$3,000,000, have been abandoned. Indiana, with the aid of her creditors, constructed 379 miles of canals in 1851, costing \$6,325,262, all of which were abandoned upon the construction of railroads along the lines of the canals. The most enterprising and sagacious men in the century were engaged in projecting and building these canals, but their expectations with regard to them were never realized."

Turning to the separate records of the different States, one of the most important enterprises in the country at the date of its construction was the Erie Canal, connecting the great lakes at Buffalo with the seaboard at New York, via the Hudson River. Built as a Government work the canal was completed in 1825, but large sums have since been expended upon it from time to time, raising its total cost to the State to \$51,600,000. A history of this undertaking and its disappointing results was given recently in the pages of the *Railway News*. After the construction of railways to Buffalo great inducements were held out to shippers of produce to use the canal in preference to the newer mode of transport, but it was found the business could not be diverted from the railways. Old and useless branches of the canal were abandoned, and the tolls were reduced from time to time, until the rate was finally fixed as low as one cent per bushel for the carriage of grain. In 1882 the State Constitution was amended, and all tolls were abolished, though without appreciable growth of traffic resulting. The returns for the last year of working under the old constitution gave a total cost of the 607 miles of \$68,229,416; the gross income was \$1,239,448; the expenditures \$1,099,974; the net income being less than one-fifth of one per cent. upon the capital cost. Of the minor canals in the State most have been abandoned from want of traffic or failure of water supply. The only case of continued and profitable working is afforded by the Delaware & Hudson Company, whose canal property has been made gradually subservient to large coal interests and many hundred miles of railroads.

The same association with railroad property has saved the existence and secured a certain amount of usefulness to the chief canal in the neighboring State of New Jersey, the Delaware & Raritan Canal, which, amalgamated with the Camden & Amboy Railroad, is operated as the United New Jersey Division of the great Pennsylvania Railroad system. So far from being able to compete with railroads as means of transportation, it is only as auxiliaries that these old-fashioned lines of communication retain much show of vitality as profitable enterprises.

The State of Pennsylvania early in its history devoted much attention to the perfection of a canal system uniting the large river which traverse the country. With the discovery and development of the vast coal deposits of the State, a fresh impetus was given to canal construction, but all the advantages of Government aid, and an abundance of the kind of traffic most suited for water carriage, could not avail to maintain profits long when once railroad building had been commenced. It was in connection with

outlays on canal property that the State was led into the bankruptcy and *quasi* reputation upon which Sydney Smith delivered his well-known phillipics. The alarming increase of the State debt, the enormous excess in the cost of completing many of the works above the estimates of the engineers, and the failure in many cases of the finished lines to pay expenses and repairs, became subjects of serious consideration, and a change of policy was demanded by public opinion. The work on some of the lines was suspended, and finally, in 1840, the State finances were in such a condition that the further prosecution of the public works was suspended. Such canals as were not permanently abandoned were disposed of to the different railways or other private companies at a heavy loss. It is calculated that some \$6,000,000 was expended on abandoned works, while the difference between net earnings and interest paid during the period of State ownership was not less than \$30,000,000. The expenditure exceeded \$70,000,000, while the State realized scarcely one-sixth of that sum in the disposal of its interests. The Pennsylvania Railroad acquired the chief portion of the State canals. One of the divisions, however, fell into the control of the Lehigh Coal Company, and is now operated in connection with its lines of railroad.

A similar, if not so disastrous a history attended the Pennsylvania canals constructed by private enterprise. All those not worked immediately in connection with coal properties have been frequently and seriously embarrassed, passing into the hands of the mortgage creditors. Of the solvent and more or less prosperous undertakings, the Lehigh Coal & Navigation Company above mentioned controls large railway interests, and its lines are now leased to the New Jersey Central Company, itself under lease to the Philadelphia & Reading Railroad Company. The Schuylkill Navigation Company, at one time a very powerful and prosperous corporation, illustrates very forcibly the "manifest destiny" of canals. The company was incorporated in 1815, and was for many years the most successful of the many water routes, tapping the anthracite coal regions of Pennsylvania. Prosperity, however, was not reached until after 1830, when active development of coal production commenced. From that year, owing to the rapid increase of tonnage and the absence of competition, handsome dividends were paid, and the price of the stock rose to three and a half times its nominal value. As soon, however, as the Philadelphia & Reading Railroad was constructed to Port Richmond in 1842, opening direct connection with the coal regions, the canal was exposed to active rivalry. The unequal contest was only prolonged by the Schuylkill Company securing control of some tributary lines of railroad; but, after more than one period of bankruptcy, the canal passed into the hands of the Reading Company in 1880. The Susquehanna & Tide Water Canal several years previously had shared the same fate, but the receipts have continued to decline under the management of the new owners.

Among the other canals of the Eastern States the most valuable is the Chesapeake & Ohio, a work commenced shortly after the Declaration of Independence. The project was, however, only carried to completion in 1850, and great results were expected from the communication opened between the Potomac and the head waters of the Ohio River. The canal, though nominally worked by a joint-stock company, is really owned by the State of Mary-

land by virtue of mortgage loans of \$6,375,000. Besides this there are other funded debts approaching \$2,000,000, while the actual accumulation of debts in the past (including interest and State claims) are estimated at \$20,000,000. No interest has been paid on the bonds held by the public since 1864.

The State of Ohio has been especially unfortunate in its experience of canals. The present mileage is given as 674, constructed at a cost of over \$25,000,000, but 205 miles have been abandoned, costing over \$3,000,000. The State Canals, previously worked at an annual loss, were in 1861 leased to a corporation for a period of ten years for an annual rental of \$20,775. They were leased again in 1871 for another period of ten years, but in 1877 the canals were surrendered, because of the State having allowed the destruction of the basin at Hamilton, Ohio. A receiver was appointed when the company surrendered the canals and he worked them for a year at a loss. The Board of Public Works then took charge of them, and by the latest account the expenses of the department were about covered by the receipts.

Almost the sole exception in the United States to the dismal record of loss and disappointment which has followed canal construction, is to be found in the case of the St. Mary Falls Ship Canal in Michigan. This work is a short link of about a mile in length, which permits of the passage between Lakes Huron and Superior, avoiding the Falls of St. Mary. It can, however, hardly be contended that this is an instance of profitable canal enterprise, since it is a mere completion of an unrivaled chain of natural inland navigation. The work, moreover, has been almost from the first a State undertaking. For twenty-five years the State of Michigan conducted the business of the canal, charging the vessels only such tolls as would pay the operating expenses and repairs, the great aim being to make the tolls as light a burden as possible. The United States offered to take the canal and manage it free of tolls. The State of Michigan accepted the proposition, and the transfer was effected in 1880.

The following figures are taken from the official records of the year 1880, latest complete returns made to the State Department at Washington of the results of working the canals which have not been abandoned:—

State.	Mileage.	Cost.	Gross Income.	Expenses.
New York.....	608	\$68,229,416	\$1,239,448	\$1,399,974
New Jersey.....	171	10,776,353	635,108	461,762
Pennsylvania.....	529	37,706,645	1,562,018	588,024
Delaware.....	14	3,730,230	201,783	62,245
Maryland.....	104	11,290,327	372,616	227,277
Virginia.....	44	4,042,363	104,048	71,632
North Carolina.....	13	300,000	8,000	3,000
Georgia.....	25	1,907,818	8,200	14,362
Florida.....	10	70,000	Not returned.	
Louisiana.....	19	2,030,000	27,840	13,650
Texas.....	8	340,000	4,535	3,454
Illinois.....	102	6,557,681	107,605	125,601
Michigan.....	3	7,425,300	52,519	28,532
Ohio.....	674	15,022,503	214,891	223,643
Oregon.....	74	600,000	Not returned.	
Total for U. S.,...2,515		\$170,028,636	\$4,538,620	\$2,954,156

The above figures of "cost," it will be remembered, do not by any means represent the full outlay for the construction of the various canal systems, but merely the capitalization in the hands of the existing owners, railway companies and private corporations, by whom most of the systems have been obtained at foreclosure sales or direct acquisition at enormous discount, after a period of State ownership, nor does it include the amounts advanced by the State governments or municipal bodies. With all these deductions from cost and with all the advantages of

working in association, instead of in competition, with railway properties, the return on the capital, it will be seen, is considerably less than 1 per cent. With such a varied field for traffic development as presented by the United States, with all the varying circumstances of sea-board, lake, river, and inland connections, and of State, railroad, and private control, the above aggregate figures are eloquent arguments as to the insufficiency of canal accommodations for traffic, and the unremunerative character of these enterprises at the present day.—*Railway News*. (London.)

MORE ECONOMY OF OPERATION NEEDED.

THE attention which has been called to railway rates and operation through the daily press, and the action of the railway commissioners of several States, cannot fail of having some good results as far as both the railways themselves and the public are concerned. The result of investigation into the details and methods of any business, even though the spirit which prompted such investigation be a hostile one, nearly always directs attention to certain points in which improvements can be made in conducting business. In the investigation which took place in Illinois a short time ago the closest examination sufficed to show that the numerous claims of extortion and discrimination which had been urged rested upon very slight ground, and it was found that the charges brought forward were either a perversion of the true facts of the case or were founded entirely upon misunderstanding of the situation.

Viewed from the railroad standpoint, however, the results of the conferences and inquiries referred to have been largely beneficial to the roads, even though the motives which led to such investigations were unfriendly ones. An advantage has been gained from a full ventilation of the fact that the rules which govern railway charges between various points are mainly formulated from the same principles which hold in other classes of business. This view of the case has been virtually conceded by the majority of those who presented evidence which they considered condemnatory of western railroad management.

Such approximate operating returns for the past year as we have been able to obtain in relation to various roads, show that, while there has been generally a decrease in gross earnings, there has also been a noticeable decrease in operating expenses. The decrease in expenses, however, is not usually equal to that in earnings, thus sustaining the position we have so often taken in the past, that it is almost impossible to reduce expenses as rapidly as the sudden declines which so often affect the volume of traffic and earnings. The result of such difference in the ratios of decrease in earnings may have such an effect that the highest cost for doing a certain amount of business can come in the season of smallest traffic. Though there has been a material reduction in the price of some classes of supplies, notably in the case of steel rails, yet it is clearly proved that the sum saved through such reduced purchase figures is not equal to the increased proportional expense of doing business, caused by lighter traffic. The result of the year's working, therefore, will doubtless show a higher cost per ton per mile than held in 1883.

This view of the case will by no means bear out the assumption of numerous persons that, in view of the low price of farm products and other freight, there should be a material reduction in railroad rates—the fact being that low prices in freight can be accompanied by comparatively high cost of transportation.

The second week of the new year, however, seems to indicate more promise, and not only is a new feeling setting in as regards prices of farm products, thus inducing a larger amount of railroad shipment, but there is also consequently a better demand for railway securities. There seems also an awakening to some extent among various manufacturing industries, and the papers are full of notices of firms which have resumed operations to a greater or less proportion of their capacity.

The coming year bids fair to see an increase in the work of railway building over last year's figures. The low prices of railway material and comparatively low rates of labor, afford an opportunity which may not again happen for several years for the older lines to make, at a low cost, renewals and betterments to their roads already in operation, or extension of their branches into such territory as may seem profitable.

There are also reports of more or less new enterprises, a number of which are comparatively important lines, traversing sections of country needing better rail facilities and which will probably afford adequate revenue to the first roads running through them. There is also the usual number of visionary lines which will probably never assume more than a paper existence. There is also, we are sorry to say, some indication of the renewal of attempts to build new lines through territory already over-supplied, or to construct such lines parallel to existing roads. This building of lines not needed may be done by persons who have a false idea of the cost of building and operating railroads, or who wish to absorb the surplus wealth of a confiding public by so doing. In some cases the conception and construction of such lines is due to a desire to blackmail to a certain extent lines already in operation, in hopes of a profitable sale of their properties to them when finished.

In regard to all schemes of new lines, except in cases where the needs of the country absolutely seem to demand increased railroad facilities, it would be well to exercise caution. The outcome of so many lines built in the past under such conditions has been most disastrous both to the roads themselves and to those owning their securities. The present list of roads in hands of receivers strongly exemplifies this fact.

The testimony taken before the Illinois railroad commissioners showed that the receipts per ton per mile were lower in 1884 than in 1883, and that figure in turn was less than rates received in 1882. Even with a return of better times there is no probability of anything like a material increase of rates; any future increase of earnings will probably be dependent upon a larger volume of traffic. Neither is there much prospect of any material reduction in cost of operating expenses, though a large volume of business naturally decreases the cost per ton or per passenger per mile by reason of the larger traffic figures over which the items of fixed expense are to be spread.

In a former number we have stated that the proportion of operating expenses of our roads in general, in which there seemed a chance of any material economy in the

future by improvement of methods, was not over 20 per cent. As only a portion of this percentage could be saved by any such improvements, it seems that the possible gain through any radical methods is very small. In addition to this limitation we have also to consider the many items which tend to increase the cost of transportation. The increasing competition between different lines has induced on all sides greater concessions to the patrons of the road. The freight shippers have their merchandise now carried in trains which make nearly passenger speed, and to effect this in some instances the cars are supplied with air-brakes, thus adding materially to their expense, together with the increased cost of running such heavy trains at high speed. Passengers have more facilities offered them for the same money, and the amount spent in running extra chair, sleeping and dining-cars is large. The methods of advertising and canvassing territory is very expensive, and the practical value of some of these outlays seems decidedly questionable. The evil having once crept in, it is hard for any road to take a backward step in the matter.

These points will emphasize further the necessity of the utmost economy in railway operation in the future. The period has undoubtedly been reached when the road that pays anything like a reasonable return upon a capitalization not exceeding the present cost of the property, except in times of universal prosperity, is the exception and not the rule. This state of affairs was, as far as concerns Illinois roads, clearly set forth in the statement just published by the State railroad commissioners.

Any surplus of net earnings being therefore an uncertain quantity, it is desirable that in prosperous years some provision be made, if possible, for tiding over a more disadvantageous season. It has been too much the custom on the part of shareholders to call for a full division of profits among those holding the shares for the time being. This, as has been often said arises from the fact that so much stock is but temporarily held for speculative purposes. An action on the part of regular investors to patronize only the dividend-paying stocks of roads whose managers have acted in a conservative manner in this respect, might perhaps have a wholesome effect in the future. To sum up these remarks, we would say that while the immediate future seems to present some features of hopefulness over the situation last year, yet the closest economy and watchfulness must still be exercised if successful railroad operation is to be the end reached.—*Railway Review*.

RAILWAYS IN OUR COLLEGES.

THE following discussion of railway problems has been added to the curriculum of Yale College for the current academic year, to be conducted under the supervision of Mr. Arthur T. Hadley:

RAILROADS: THEIR HISTORY, THEIR BUSINESS METHODS AND THE SOCIAL PROBLEMS CONNECTED WITH THEM.

Introduction.—The questions involved, and the methods of studying them.

I. *History of the Transportation System of the United States:*

1. Roads and waterways; especially (a) the Erie canal and (b) the Mississippi river

2. History of railroad extension.
3. Railroad consolidation down to 1872.
4. Fast-freight lines, etc.
5. Railroad pools formed previous to 1877; especially (a) the Missouri River pools and (b) the Southern Railway and Steamship Association.
6. Trunk-line contests down to 1877; with accounts of (a) the "Evener" system, and (b) the Standard Oil contract.
7. The Trunk-line pool and the Joint Executive committee; the trunk-line contests of the last seven years.
8. The condition of the railroad system to-day.

II. *Railroad Business Methods and their Effects upon the Community.*

1. Special characteristics of railroad business.
2. Railroad accounts; with especial reference to (a) the difference between the accounts of railroads and those of other lines of business; and (b) the questions involved in separating maintenance from construction account.
3. Railroad reports and statistics.
4. Railroad expenses, with special reference to the distinction between fixed charges and other elements of expense.
5. Railroad rates. (a) Actual practice of the railroads in making rates. Classification. Through and local rates. Special contracts. (b) Popular criticisms. (c) The attempt to base rates upon cost of service is wrong. (d) The principle of charging what the traffic will bear is right in itself, but liable to abuse. (e) Discrimination, right and wrong.
6. The reduction in rates during the last fifteen years, how effected. How cost of service becomes an element in charges based upon what the traffic will bear.
7. Competitive rates (a) against water routes, (b) in railroad wars.
8. The pooling system, in railroads and elsewhere. Its causes and effects.
9. Railroad profits. Railroad investments. Railroads and commercial crises.
10. Speculative railroad building and management. (a) Parallel railroad. (b) Construction companies. (c) Other subsidiary corporations. (d) Conflict of interest between owners and management; (e) Between stock and bonds. Receivership.

III. *Foreign Railroads and Railroad Legislation:*

1. England (a) railway management and legislation down to 1872. (b) The railway commissioners and the investigation of 1881. (c) Comparison of English and American railroad service, traffic, rates, etc.
2. Continental Europe. (a) Summary of railroad history and legislation in Belgium, Russia, Austria, France, Italy. (b) The system of avoiding discrimination by extension of pooling arrangements into the fullest detail. (c) Continental traffic and rates compared with those of England and America.
3. General information on the development and character of the railroads of the world.
4. Comparison of state and private ownership.

IV. *Railroad Legislation in the United States:*

1. Brief summary of miscellaneous points. (a) Special charters vs. general railroad law. (b) Limitation of dividend. (c) Systems of taxation. (d) Liability on bills of

lading or for performance of duty as carrier. (e) Accidents.

2. Subsidies. (a) Land grants. (b) Municipal subscriptions, etc.

3. The granger movement.

4. State railroad commissions and State control of rates. (a) Pro rata and short-haul bills. (b) Commissions with active powers (Georgia, California, etc.). (c) Commissions to secure publicity (Massachusetts, etc.).

5. Proposed Congressional legislation, history of the Reagan bill and the various substitutes offered.

6. Present needs and prospects.

The instruction is mainly given by lectures, but it is intended that there shall be the freest discussion, by the whole class, of all points that are doubtful or obscure.

The following course of reading is marked out in connection with the lectures for the coming year:

Adams—Railroads, their Origin and Problems.

Farrer—The State in its Relation to Trade: Chapters VIII., X., XI., XII., XVII.

Sterne—Railroad Poolings and Discriminations.

Black—Letter to the committee of the New York Chamber of Commerce, November 16, 1880.

Letters of Messrs. Fink and J. J. White on the question of pooling.

Fink—Argument before House Committee on Commerce, January, 1884.

The students are also urged to read a number of works by Blanchard, Cooley, Atkinson and other writers bearing on the subjects discussed and referred to in the lectures, and are further requested to prepare original essays on special topics appertaining thereto. These essays are to be read before the class and made the subject of general discussion.

A WEST-BOUND freight on the B. & M. main line the other day reported at Dorchester that there was a man lying doubled up near the track some distance back, who looked as if he might have been hurled off a train and killed or made insensible.

The word was sent in and orders were sent that the east-bound passenger should stop and an examination of the matter be made. As they approached the place designated they saw the man, evidently in the same position he was in when seen by the freight-train crew. The train stopped, and the conductor and the engineer and the fireman and most of the passengers got off in a great excitement and gathered around the prostrate form.

"See how he is doubled up," said one of the passengers. "Poor fellow, that must be just the way he fell."

"Doesn't seem to be bloody," said another.

"Look, he moves," said a third, as they came up closer. "He isn't dead, anyway. Seems to be breathing all right."

"I don't believe he is much hurt," said a little man from Kansas. "Here, what's the matter? Can you hear?"

The figure raised up, and wiping his eyes with a pair of grimy fists, said: "It beats h—l if a man can't lay down and take a nap without having an excursion run out to gape at him."—*Lincoln (Neb.) Journal*.

"I DON'T understand how the railroads can afford to reduce the fare to one cent a mile." "Oh, it's very simple." "They have to make up the loss in some way." "They do." "How?" "Make the sleeping-car porter divide with the company."

American Railroad Journal.

(ESTABLISHED IN 1831.)

PUBLISHED MONTHLY BY THE

PHENIX PUBLISHING CO. OF N. Y.,

AT NO. 323 PEARL STREET, NEW YORK.

J. Bruen Miller, Editor.

J. Howard Barnard, . . . Business Manager.

Entered at the Post Office at New York City as Second-Class Mail Matter.

SUBSCRIPTION RATES.

Subscription, per annum, Postage prepaid.....\$3 00
Single copies.....25

ADVERTISING RATES.

Space (3¼ in. wide).	1 Mo.	3 Mos.	6 Mos.	12 Mos.
1 inch.....	\$4.00	\$10.00	\$17.00	\$31.00
¼ col. (or ¼ page).....	9.00	22.00	40.00	70.00
½ col. (or ½ page).....	15.00	40.00	70.00	120.00
1 col. (or 1 page).....	26.00	72.00	130.00	235.00
1 page.....	48.00	115.00	210.00	400.00

For inside of covers, add 25 per cent.; for outside of back cover, add 50 per cent.; no advertisements will be taken for title-page.

The above terms are *net*, and for three months, six months or yearly contracts, are payable quarterly. Contracts for less time are payable after receipt of first number containing the advertisement.

MR. FREDERIC ALGAR, Nos. 11 and 12 Clements Lane, Lombard Street, London, E. C., England, is the authorized European Agent for the JOURNAL.

NEW YORK, JANUARY, 1885.

Principal Contents of this Number.

CONTRIBUTIONS.

(Written for the American Railroad Journal.)

Railway Station Architecture—By Chemin de Fer.....321
A Trip over the New York Central and Lake Shore to Chicago—By Charles H. E. Redding.....322
Attention to Details in Railway Travel—By Marvin C. Williams.....323
The Lighting of Street-Cars—By F. Martin Gayler (Street-Railway Department).....340

EDITORIALS.

Apace With the Times.....332
Railway Education.....332
The Inter-State Commerce Bill.....333
Editorial Notes.....334
Coupon Tickets on Street-Railways (Street-Railway Department).....339

MISCELLANEOUS AND SELECTED.

The Painting of Passenger-Cars—Light vs. Dark Colors—By R. McKeon. A Paper read before the Master Car-Painters' Convention.....324
The Dangers Threatening Railways.....326
Canals versus Railways.....327
More Economy of Operation Needed.....329
Railways in our Colleges.....330
Evils of Railways in 1830.....335
Some Useful Notes for Engineers.....335
Railway Capital in Great Britain.....335
Wear of Rail-bolts by Creeping of Track.....336
Locomotive Building in 1884.....336
Sleeping-cars in England.....336
Railroading Under Difficulties.....337
Railways in Switzerland.....337
Primitive Railroading.....337
Praising the Engineers.....337
Railway Taxation in New Jersey.....337
Canadian Railway Progress.....338
Coal Production.....338
Fictitious Dividends Rebuked.....338

STREET-RAILWAYS.

Coupon Tickets on Street-Railways (editorial).....339
The Lighting of Street-Cars—By F. Martin Gayler.....340
Rails for Street-Railways.....341
Electric Motors on the Brooklyn Bridge and the Elevated Roads.....341
Steam Power on Street-Railways.....342
Street-Cars in Mexico.....342
A Street-Railway for Sale.....342
A New Electric Street-Railway.....343
A Cable Road in Lisbon.....343
A Street Cable Company.....343
Returned by a Car Conductor.....343
Ventilation of Cars (communicated).....343
Street-Railway Notes.....343

NEW INVENTIONS.

Marshall's Dynamo-electric Railway Switch.....344
Owen's Safety Coupler.....346
Randolph's Car-coupling.....346
Heston's Improved Piston-packing.....348
Bewsher's Balanced Slide-valve.....348
Scale in Steam Boilers.....348
Preserving Railway Sleepers.....349
The Westinghouse Brake in France.....349
Making Railway Travel Safe.....349
Patents Industrially Classified.....349
The First Patent.....349

APACE WITH THE TIMES.

WHETHER the sanguine anticipations of the optimist are to be realized, and the year 1885 be one of renewed prosperity to all our great industries, or whether the dull season will conclude to linger with us a while before it departs, the JOURNAL will continue to be a faithful reflex of the requirements of our railways, and starting out upon its fifty-fifth year of existence, dull as the outlook of trade at present is, it can recall duller seasons and gloomier prospects.

We are content to await in patience a return of better times, and shall devote our humble efforts to quickening the return, by pursuing our paths with cheerfulness and hope. Whether the times be prosperous or dull, the AMERICAN RAILROAD JOURNAL will continue to furnish the railway world with a monthly magazine and review, and solicits contributions toward this worthy end from every person who is truly interested in railway progress. With the current number we publish four more original contributions, making the total number appearing since the change in management in June, thirty-four; and as a record of seven months' work, we honestly don't think that more could have been asked had the times been those of the most golden-hued prosperity. Upon this record we rely for judgment, and by this record we shall seek guidance for the future.

RAILWAY EDUCATION.

IN response to a number of inquiries we publish elsewhere in our columns the course of railway study introduced into the curriculum of Yale College during the present year. That the chief educational institution of the country should recognize the importance of railway interests to an extent that induces its faculty to furnish a special course of study on the subject is of itself an important fact; but that this instruction should be carried out so minutely, treating of the details of the business with such fidelity to the actual requirements of a sound railway education, is a wonderful exemplification of the vast and overshadowing proportions to which the railway industry has grown. By this one act the faculty of Yale College have elevated railway management to the dignity of a science, an elevation not only gratifying to the railways, but of incalculable benefit to the country.

It may be urged that the theoretical railway knowledge imparted by this course of study will be of little practical benefit to the students, and that the collegian crammed with this scientific study will be unable to compete in usefulness with the practical railway man whose knowledge is derived from years of experience; but with this opinion we respectfully take issue. Experience is essential in the conduct of railways, as it is in any business or profession. Responsible positions on railways are not awarded to men

simply for their knowledge, but on account of their special fitness and tried worth, and without years of experience such special capabilities cannot be determined nor measured. The railway manager risen from the ranks is a man to be respected and prized, and for such there will ever be constant demand. But it is folly to say that there is at the same time no field open for the careful student who has thoroughly and exhaustively studied the problems of railway construction and management as a science, as it is folly to say that a business man is not benefited by a thorough and liberal education. It is experience that fits one to command and education that enables him to profit rapidly by his experience. There is a liberality, a desire for improvement, an avoidance of what may be termed "ruttishness," which education alone can furnish, and when this education is in part directed in those identical fields which the student will eventually enter, great results can be anticipated. The man of experience alone pursues beaten paths, the man of education is prompted to explore, and there is no technical information which cannot be benefited by a prior theoretical education.

But to strike at the root of the matter and to state the immediate benefits that will accrue from the study of railways in the light of a science, it is easy to see that the action of the Yale authorities is more than a recognition of the importance of railways to the prosperity of the country. It is also a very clear-headed recognition of the fact that other fields must be opened to the college-bred man than the three learned professions, already overcrowded. Thousands of young men are annually graduated from American colleges, and it is the duty of their instructors to see that their education shall be of practical benefit both to themselves and to the community. A liberal education must have higher aim than self-gratification, and with the present over-supply of lawyers, clergymen and physicians, other channels of usefulness must be opened to the collegian. Many years ago the importance of this step was recognized, and the establishment of scientific and agricultural schools and departments was begun with zeal by all the large colleges. As a result, civil, mechanical and mining engineers, architects and farmers, were yearly graduated from these institutions until at present the supply is in excess of the demand, and the ingenuity of the college faculty is again taxed to discover a new field of usefulness for the graduate. Yale has recognized the field of railway construction and management as one in which a liberal education can be employed to advantage, and we think this recognition is wise and judicious.

That years may elapse before the benefits of this education become apparent in the actual service of the college graduate is possibly true, but immediate benefits will be experienced of no inconsiderable moment. The study of

railways as a special branch of technical knowledge will, as we said before, elevate it to the position of a science, and such elevation will immediately be followed by a step indispensable to all sciences, and one of the distinguishing features of a science; namely, an exact terminology and classification. The facts and principles connected with railways will be collated under appropriate heads, right names will be given to the right things, and railway knowledge will be systematically arranged in concise and proper form. This alone is of the greatest benefit, and when to it is added the scientific and literary contributions that will emanate from the study of railways as a science, we can well afford to wait a few years for the practical benefits of actual railway service by the students to be realized. In the meantime it is highly probable that Yale's rivals will also enter the field in competition and to them all we say God speed! They will be doing a service to the students, to themselves, to the railways and to the country, and the inauguration of the study of railways is a further illustration of the practical benefits of our American college system, inasmuch that present needs whether national or local, are quickly recognized by our higher institutions of learning. Unlike European universities, they do not confine themselves to the *has been* but also give consideration to the *to be*.

THE INTER-STATE COMMERCE BILL.

THE Inter-State Commerce bill as introduced by MR. REAGAN of Texas, has passed the House of Representatives—as might have been expected. The bill was designed as a blow at the "aggressive" power of railways, and of course none of our worthy representatives would dare face their constituents after neglecting this glorious opportunity to attack the bloated bondholder and capitalist in general.

A careful glance at the provisions of the bill will show that railways are to be prohibited from doing anything beyond running their trains, and least of all must they be allowed to make any money under any circumstances. In the kindest and most paternal manner the government intends to show our railway magnates and capitalists just how things should be done in the interests of the public, and the greed of gain on the part of those selfish individuals who have invested their capital in railways is to receive a wholesome check. They are to learn that a return for the moneys invested is no longer to be countenanced, as savoring of oppression, and the railway managers are to be restricted in their powers to an extent that will make them hold the positions of upper-class brakemen or conductors.

We are weary of comment upon the dumb-headedness of Congressmen in general, and have resolved to express

no surprise at any of the thousand and one measures of demagoguery which may be attempted in our national legislature; but we can hardly refrain from giving utterance to a feeble prayer that if Providence cannot instill a little common-sense into the average Congressman, it will at least direct his efforts in fields where he can talk much and do little. Of course, as might have been predicted, the chief supporters of the REAGAN bill came from States where railway progress is least active, and if these gentlemen can be said to be more ignorant upon one subject than another, it is upon the subject of railways. No one questions the fact that many of the supporters of the bill voted for it under a strict sense of duty and with the consciousness that their action was entirely unselfish, and this makes us feel all the sadder. Knavery, in the abstract, is less to be feared than ignorance, for it dare not work in the light. After all perhaps the great scoffer, BOB INGER-SOLL, was right, when, to illustrate the fallacy of the theory of Divine Omnipotence, he asked his hearers whether in sober truth anyone believed that the Creator could impart wisdom to Congress.

Fortunately the bill has gone to the Senate, where there is every chance of its quiet demise under the weight of a decided majority in the negative, and even failing this the President may have his little say about it. We have our faith in the Senate, however, and the bill bears the marks of a short and uneventful life. Possibly the grave and reverend Senators are not much wiser or better men than their brother legislators in the other wing of the Capitol; but then they are compelled to meet their constituents but once in six years, and any little slip in the direction of common-sense may be overlooked and forgotten with the lapse of time. They talk about this being a free country! A more absurd proposition was never made. There is an autocrat in this country, more tyrannical, despotic, remorseless, and, withal, more stupid than the most barbaric of Eastern rulers, and his name is Constituent. Before him tremble all official creation, Alderman, Legislator, Governor, Congressman, nay even the President himself, and his word is law—and generally very bad law. The Constituent is the motive power of the REAGAN bill, and its defeat will be the sign for a mighty outburst of his imperial fury. We are eager for the outburst, and trust his majesty may have occasion to rage without stint.

EDITORIAL NOTES.

THE managers of the New York elevated roads have made a bold and unexpected move. Harassed by burdensome taxation in this city they have suddenly removed their offices and headquarters to the peaceful town of Irvington, thus seeking a taxation under another county, and under more moderate appraisal. This was indeed shrewd, and we shall now look to hear of the Pennsylv-

nia road establishing its headquarters in Honolulu, and of the N. Y. Central transporting its offices to the fertile soil of Alaska. A wise man is ever ready with expedients.

* * *

IT is stated that the gross earnings from the railways of this country during the year 1882 amounted to \$770,356,716, while the gross earnings of our licensed saloons in the same period amounted to \$979,345,000. This fact seems to have galled some of our esteemed contemporaries, and they demand that this preponderance in favor of rum should be checked by a greater taxation of spirits and a less taxation of railways. For our part the only surprising feature of these comparative earnings is that those realized on rum are so little in excess of those realized by the railways, and we earnestly deprecate any suggestions of Congressional interference. All the legislation in the world will not persuade a man to resort to a trip upon a railway as a substitute for intoxicating drinks, and it must be recognized as an undeniable fact that the more Congress tinkers with any question the worse we are off.

* * *

CAN anyone in his sober senses believe that passengers can be transported from New York to Chicago and St. Louis, even on an emigrant train, for \$1, at a profit to the carriers? Yet this is the point to which the war of rates has brought the emigrant fare between these cities on both the Pennsylvania and the West Shore. And the West Shore is in the hands of a receiver too! Why not do a thing handsomely and transport passengers free, adding a chromo or two by way of inducement.

* * *

IT is a great pity that this system of rate wars is confined to railways, and we would like to call the attention of all trades and industries to the example which the railways are offering. Conceive of the universal joy with which we would hail a war in rates between butchers and bakers and grocers! That would be something practical, and we long to see the enterprising competition now existing between railways extend into domestic channels.

* * *

WE have received the annual report of the Board of Railway Commissioners of New York State, and it is certainly a most voluminous and exhaustive work. Apart from the elevated roads, the railways of this State are stated to have carried, during the fiscal year ending September 30, 1884, one billion and three-quarters passengers over one mile, and nine million tons of freight for the same distance. This is an increase in travel of fifty-four per cent. over the year previous, but at the same time there is a decrease of earnings of nearly \$8,000,000, the total earnings for the year amounting to \$126,204,164, against \$133,980,625 during the year previous.

Evils of Railways in 1830.

THE New York *Gazette* of September 20, 1830, gives the following humorous argument, which it says was used by a canal stockholder in opposition to railways: "He saw what would be the effect of it; that it would set the whole world a-gadding—twenty miles an hour, sir! Why, you will not be able to keep an apprentice boy at his work; every Saturday he must take a trip to Ohio to spend the Sabbath with his sweetheart. Grave, plodding citizens will be flying about like comets. All local attachments must be at an end. It will encourage flightiness of intellect. Various people will turn into the most immeasurable liars; all their conceptions will be exaggerated by the munificent notions of distance—'only a hundred miles off! Tut, nonsense, I'll step across, madam, and bring your fan.' 'Pray, sir, will you dine with me to-day, at my little box at Allegheny?' 'Why, indeed, I don't know—I shall be in town until 12. Well, I shall be there, but you must let me off in time for the theater.' And then, sir, there will be barrels of pork, and cargoes of flour and chaldrons of coals, and even lead and whisky and such like sober things, that have always been used to sober traveling, whisking away like a set of sky-rockets. It will upset all the gravity of the nation. If a couple of gentlemen have an affair of honor, they have only to steal off to the Rocky Mountains, and there no jurisdiction can touch them. And then, sir, think of flying from debt. A set of bailiffs, mounted on bombshells, would not overtake an absconded debtor—only give him a fair start. Upon the whole, sir, it is a pestilential, topsy-turvy, harum-scarum whirligig. Give me the old, solemn, straightforward, regular Dutch canal—three miles an hour for expresses, and two for jog or trot journeys—with a yoke of oxen for a heavy load! I go for beasts of burden; it is more primitive and scriptural, and suits a moral and religious people better. None of your hop-skip-and-jump whimsies for me."

Some Useful Notes for Engineers.

AMONG the questions most frequently asked of our inspectors when making their ordinary visits, says the *Locomotive*, are the following, which are of such general interest to engineers as to warrant publication:

1. How much water per pound of coal should be made into steam at 60 pounds pressure per square inch with 60 inch tubular boilers properly made, well set, and carefully fired?

Under the above conditions, from 8 to 10 pounds, dependent somewhat, of course, upon the quality of the coal and the temperature of the feed water.

2. How much more coal per pound of water does it take to carry 80 pounds per square inch than it does to carry 60 pounds per square inch?

This question could with more propriety be put as follows: How much more heat does it take to make a pound of steam at 80 pounds pressure per square inch than it does to make a pound at 60 pounds per square inch?

Practically, no more coal will be required; theoretically, about 0.4 of one per cent., or about $\frac{1}{250}$ part more.

3. Do you get enough better results from steam of 80

pounds per square inch than you do from steam 60 pounds per square inch to pay the extra wear and tear of boiler and engine?

Depends entirely upon conditions. If you can make use of steam of 80 pounds pressure, it pays to use it; there are conditions, however, where 60 pounds, or even less, would be decidedly more economical.

4. How much more heat do you get from pipes carrying 60 pounds pressure than from pipes carrying 10 pounds pressure?

Two and one-tenth per cent. more heat will be given out per pound condensed from steam of 60 pounds pressure than from steam of 10 pounds pressure, in falling from temperature due to the respective pressures of to 212° Fahr.

5. What proportion of direct heating surface to the volume of a fairly-protected room is required to maintain the temperature of the room at 60° Fahr. in buildings heated by steam?

From $\frac{1}{15}$ to $\frac{1}{20}$, according to size and exposure of room.

6. How much is a given amount of steam reduced in bulk by compressing it from 60 pounds per square inch to 80 pounds per square inch?

About 20 per cent. See any steam table.

Railway Capital in Great Britain.

ONE of the most marked features about the capital invested in railways in Great Britain, says the *London Railway News*, is the steadiness of the return to the investor, when the results of the various systems are taken in the aggregate. In no other industry would a retrospect over ten years show such slight variations as does the subjoined table, giving the average rate of dividend paid by the railway companies of the United Kingdom, from 1873 to 1883, and the proportion which the different classes of capital bear to the total. In these ten years the return to the ordinary stockholders has not varied 1 per cent., the widest fluctuation being between 4.99, in 1873, and 4.02, in 1879. So far from 1883 having been the worst which railway shareholders have experienced in the decade, there were five years in which the rate of distribution was lower than last year. This is a result which must be considered as highly encouraging, when the vast amount of new capital raised amounted to £196,000,000 for the ten years, and the loud complaints as to the dullness of trade which were even louder last year than for some time before, are considered.

Ordinary.		Pref. & Guar.		Loans & Debts.	
% of Cap.	Div.	% of Cap.	Div.	% of Cap.	Div.
1873..	42 4.99	32	4.48	26	4.29
1874..	41 4.49	33	4.52	26	4.28
1875..	40 4.72	34	4.54	26	4.26
1876..	40 4.52	35	4.48	25	4.26
1877..	39 4.51	35	4.47	26	4.25
1878..	38 4.32	37	4.39	25	4.23
1879..	37 4.02	38	4.30	25	4.21
1880..	37 4.72	38	4.35	25	4.22
1881..	37 4.66	38	4.29	25	4.21
1882..	37 4.73	38	4.28	25	4.21
1883..	37 4.68	38	4.26	25	4.21

A satisfactory feature of the above figures from an ordinary shareholder's point of view is the steady decline in the rates at which the new capital has been raised. In 1873 the average return on the preference capital was 4.48, but for last year the distribution represented only 4.26 per

cent. In the case of the loans and debenture stock it is also encouraging to note that the average rate of interest is now only 4.21, against 4.29 per cent. ten years ago, and that the proportion which this class bears to the total capital has declined from 26 to 25 per cent. This is due to the clearing-off of temporary or debenture loans. Several of the companies have now no debenture loans, and it is undoubtedly sound policy to avoid the contraction of temporary loans, and to substitute for them the present form of debenture stocks. With money at its present exceptionally low rates there is a strong temptation for companies to borrow temporarily rather than exercise their capital powers. There is, however, an element of danger in this course as exemplified by the experience of so many American railways, whose financing has been successfully carried on by loans until some sharp and sudden crisis in the money market has frightened lenders, and at the same time spoilt the market which the companies previously had for their securities. In England the chances of such severe and sudden changes in the money market are more remote, but there can be no question that the smaller the amount of a company's debenture or other temporary loans, the sounder in the long run must be the state of its capital account.

Wear of Rail-bolts by Creeping of Track.

THE wear of the bolts, remarked a recent speaker on the subject, is caused by the expansion or elongation and contraction of the rails; by friction caused by the passing over them of heavily loaded trains, commonly called "creeping" by railway men; by an imperfectly constructed formation, or bed for the road; and to imperfect packing of the sleepers, which was more or less well known to all men engaged in the maintenance of permanent way. The wear of the bolts by expansion and by creeping of the rails was similar in effect, but not equal in degree of destructiveness—the creeping of a rail being a much greater destructive agency than expansion. There was creeping also attendant on expansion of the rails being due to friction from the working power of heat. The expansion or elongation of steel rail measuring twenty-four feet long and weighing 678 pounds was found, by experiments during the summer of 1881, to be 0.02 inches under a temperature reading ninety-nine degrees on a thermometer, to 0.09 inch under a temperature reading 115 degrees, the expansion or elongation of the rail being taken at two o'clock, P. M. for maximum, and eight o'clock, P. M. for minimum; the measurements were taken by means of sliding scales, of a non-expanding material, firmly fixed at each end of the rail, the scales being graduated to fifty divisions in an inch. The creeping of the rails by friction of trains was found to amount to two inches in three years. It could not be said that it continued in the same proportion year after year, but that it so continued was manifest by the constant displacement of the points and crossings and the yearly necessity of readjusting them. It was for this reason that shouldered stock-rails for points, cast-steel crossings, crossings having their point and splice rails notched, welded, riveted and fitted with distance blocks of chogs between the chair and bolted, were unsuitable and also unsafe for use on first-class railways; it was for the same reason that joint-chairs of any descrip-

tion were equally objectionable. The expansion of the rails was dependent on the geographical position of the permanent way; when it was laid in the direction of N. W. by E., and made a quick detour from E. to S. W., the expansion would take place in opposite directions and concentrate its force at some point in the change of direction on a line so situated; its force on the part lying N. W. by E. would be in the direction of the creeping of the rails, and on that part lying E. by S. W. in opposition to the creeping of the rails on one line, and *vice versa* on the other line of rails the point of concentration would be one of danger to the safe condition of the permanent way and the passing of trains, and in such cases required the careful attention of the permanent way inspector and foreman of plate-layers, who can always by inspection determine the locality of that point.

Locomotive Building in 1884.

ACCORDING to the *American Machinist* the year just closed has been a bad one for locomotive builders. During 1883 seven of the largest builders turned out 1,346 locomotives, while the same builders during the past year turned out only 901. There are only sixteen locomotive building shops in this country, and in these shops, as near as can be learned, the total number of locomotives built in 1884 was 1,271, about 100 of which were for exportation. The most trustworthy show that there are 29,227 locomotives of all kinds belonging to railways in North America. As the life of a locomotive is about twenty-five years, about 1,169 locomotives must be constructed every year to maintain the stock.

The large number of heavy engines built last year would indicate that they were growing in favor. A ten-wheel engine seems to be liked best on a heavy freight road. Almost every railway has its peculiar style of locomotives. The New York, Lake Erie and Western uses for freight-trains a long, low, black, ten-wheel engine, which is very powerful. The Pennsylvania road does not care so much for the number of wheels as for their size, and it has them made as large as possible.

A locomotive that is never seen in this vicinity is the camel-back engine, used for heavy work in the mountains by the Philadelphia and Reading Railroad. It is a double-end engine with a two-story cab set on top of the boiler. The engineer's seat is over the top of that of the fireman. These are heavy engines.

Sleeping-cars in England.

IT is only a comparatively short time, says the *Mechanical World*, (Eng.) since our railway companies introduced a regular service of trains having sleeping accommodation for first-class passengers, the pioneer company as usual being the Midland with their Pullman sleeping-cars on the American style. Several of the leading companies who run long journeys, notably the London & North-western, have now, however, followed suit, and as a consequence the night traffic has considerably increased, an example of which may be mentioned that took place on Sunday night, the 10th ult., at Euston station. No fewer than four trains were required to convey passengers to the north for the shooting season, by this company's sys-

tem. The first part of the 6 P. M. express had 19 vehicles, 13 of which were entirely given up to passengers requiring sleeping accommodation, in addition to several private saloon carriages. In the four trains into which the ordinary train was divided, 260 beds were made up, necessitating the marshalling of the trains at the platform two hours before starting. It is not too much to say that a considerable number of passengers now travel long distances in one day, who from the fatigue attending enforced sitting in one position so long, formerly took two, thus saving a day's time and hotel expenses. The London & Northwestern Company for some reason do not use bogie carriage-stock, but have adopted a system answering a similar purpose by connecting two or more six-wheel carriages together by means of passages or gangways placed at the ends and covered in by canvas and leather hoods, so arranged as to slide in or out with the play of the buffers. These carriages are fitted up in a very luxurious and comfortable manner and provided with all necessary conveniences. But still the bulk of the traveling public are unable from its expense to avail themselves of the benefits of these carriages. What is required is that some attention be now paid to the requirements of third-class passengers who are after all the chief paying portion of railway travelers. Third-class sleeping-cars (for which an extra fee in proportion to the difference in fares might be charged) are much wanted, having plain accommodation. The accommodation could take the form of sofa berths, upon which the passenger without undressing could sleep comfortably, the company providing rugs if required. Many who cannot afford the cost of first-class traveling would gladly avail themselves of such accommodation, and we have little doubt it would pay the companies to specially construct sleeping-carriages for third-class passengers.

Railroading Under Difficulties.

THE following official notice is posted in the Siamese railway stations: "The minister of posts and telegraphs hereby informs the public that the British India government has given notice to the effect that their portion of the line between Bangkok and Tavoy will be closed during the next rainy season on account of the extreme mortality among their officials. The Siamese portion of this line being, however, in the same good condition as before, will be kept open for public use between Bangkok and Pong Sakee, the boundary near the border of the British Burman territory, without interruption, during the time the British portion is closed. Notice will be given whenever the British India telegraph administration will be in a position to reopen their portion of this line."

Railways in Switzerland.

ACCORDING to the report of the Department of Public Works of Switzerland, there are 19 railway corporations in Switzerland, operating 2,883 kilometers (1,792 miles) of road. The gross earnings for the year amounted to 77,070,254 francs (\$14,874,559). The operation cost 40,062,450 francs (\$7,732,052.85). This was an average of 51.98 per cent. of the gross revenue. The cheapest operated line was the Wadensweil-Einsiedeln which only cost 43.68 per

cent. of the total earnings, but there are seven roads which cost over 100 per cent. to operate, one of which reached the enormous sum of 166.44 per cent. There was in use on all the roads at the end of the year 615 locomotives, 1,786 passenger cars and 8,972 freight cars. There were transported 24,047,487 passengers and 7,087,990 tons of freight during the year. Of this total 1,056,043 passengers and 469,711 tons of freight were carried by the St. Gothard Tunnel Railroad, which earned a total of 11,603,536 francs (\$2,239,482.43). This road was operated for 45.27 per cent. of the gross earnings and 2.14 per cent. was paid on its capital. Its length is 266 kilometers (166 miles). A total of 81 locomotives, 172 passenger and 705 freight-cars are in use on the St. Gothard Tunnel Railroad.

Primitive Railroading.

THE editor of the *Ponca, (Neb.) Journal* tells how they used to travel on the narrow-gauge railway between Sioux City and Ponca a few years ago. He says: "The narrow-gauge went up and down hill, so much so that when climbing the grade near the summit the shrieking, struggling little engine found it difficult to make headway. In those days the genial conductor always regarded the few passengers as guests and treated them accordingly, and when the train went up hill, and the engine gave a howl of despair, would get off and push behind. These were the halcyon days of railroading. We recollect going down from Ponca to Jackson one day. We were the only passenger—frequently the train had no passenger at all. Below the summit we saw a man in the field plowing. He owed us on subscription. Being short of bankable funds we desired to hold a short *seance* with him. We stated our desire to the conductor. Did he turn a deaf ear to us and whip up the train? No. He jerked the cord and stopped the train and we went and dunned the man. During our absence the conductor went to the creek and fished. Those were the pastoral, the joyful, the inimitable days of railroading. The like we shall never see again."

Praising the Engineers.

THE Delaware, Lackawanna & Western Railroad is reported to have had the least number of accidents during the year 1884 of any road of comparative length in the State of New Jersey, in consequence of which, on New Year's Day, Superintendent Reasoner caused to be sent to each engineer a letter, in which, after wishing them a Happy New Year, he praised them for their carefulness, and earnestly hoped that, if possible, they would do still better this year.

Railway Taxation in New Jersey.

THE New Jersey State Board of Assessors have filed their first annual report with the Governor. It states that there are ninety-four distinct railways in New Jersey in active operation. Twenty-six are under the control and management of the Philadelphia and Reading Railroad, twenty-four under the Pennsylvania Railroad, ten under the New York, Lake Erie and Western, six under the Delaware, Lackawanna and Western, and twenty-eight are managed within themselves, outside of any system. The

following shows the amount of taxes paid by each railway system, and also by the railways managed by themselves, taken as a whole, under the new law, for last year:

	Total State Tax.	Total Local Tax.	Total Tax.
Pennsylvania Railroad system.....	\$291,425 58	\$92,213 31	\$383,638 89
Philadelphia & Reading Railroad system.....	264,081 24	91,044 71	355,125 95
New York, Lake Erie and Western Railroad system.....	74,784 29	58,241 03	133,025 32
Delaware, Lackawanna and Western Railroad system.....	174,870 05	67,153 34	242,023 39
Railroads managed by themselves.....	172,497 60	79,871 11	252,368 71
Totals.....	\$977,628 76	\$388,523 50	\$1,366,152 26

Canadian Railway Progress.

JOHN NORQUAY, premier of Manitoba, said in an interview at St. Paul, that the policy of the Dominion government will be liberal to railroads which will tend to develop the resources of the country. In the matter of land grants, which has been a vexed question, the old narrow policy will be cast aside, and the roads treated generously. Manitobians generally are well satisfied now that the government intends to be watchful of the interests of the province. Good results are already apparent, as a number of new railways are in process of organization, some of which will probably be begun in the Spring. Before many years Manitoba will have a complete railway system. In regard to the Canadian Pacific, work is advancing rapidly through the heart of the Rocky mountains, and in the coming year the line will be completed from Winnipeg to Port Mundy. Within two years it is expected to have a through line from the Pacific coast to Montreal.

Coal Production.

THE Cumberland district has shown greater production than ever before, aggregating the past year 2,850,000 tons, about 350,000 tons increase over 1883. According to the *Baltimore Journal of Commerce*, from which these figures are taken, there was no interruption of the working of the mines during the year. The transportation to tidewater was chiefly per the Baltimore and Ohio Railroad, which brought to that city 2,150,000 tons, an increase over the previous year of 753,000 tons. The Chesapeake and Ohio Canal carried to the District of Columbia about 350,000 tons, only one-half of the quantity carried in 1883. The Pennsylvania Railroad also shows decreased shipments of Cumberland compared with 1883 of near seventy thousand tons. Beside the Cumberland brought to Baltimore by the Baltimore and Ohio road, there were 319,405 tons of gas coal from West Virginia, making the aggregate quantity of coal brought to Baltimore by that road 2,472,495 tons, an increase compared with 1883 of 875,000 tons. The Western Maryland Railroad brought from Williamsport 23,158 tons. Of anthracite and bituminous coal received there via the Northern Central road, there is also shown an increase over 1883; the quantity brought was 767,381 tons against 693,494 tons last year. There were exported foreign during the year 59,289 tons, against 63,526 tons in 1883.

The total amount of anthracite coal sent to market for the week ending December 27, as reported by the several carrying companies, was 69,695 tons compared with 396,032 tons in the corresponding week last year, a decrease

of 323,337 tons. The total amount of anthracite mined thus far in the year 1884 is 29,982,157 tons, compared with 31,547,097 tons for the same period last year, a decrease of 1,564,940 tons.

The Pennsylvania Railroad reports that the quantity of coal and coke carried over its lines for the week ending Dec. 27, was 195,573 tons, of which 156,030 tons were coal and 39,543 tons coke. Of this weekly tonnage 147,557 tons originated on the main line of the Pennsylvania Railroad, while the remainder originated on its branch lines. The total tonnage for the year thus far has been 13,142,598 tons, of which 10,326,388 tons were coal and 2,816,210 coke. These figures embrace all the coal and coke carried over the road, East and West.

The Reading Railroad reports that its coal shipment for the week ending January 3, was 184,000 tons, of which 15,500 tons were sent to and 12,300 tons shipped from Port Richmond, and 34,000 tons were sent to and 27,000 tons shipped from Elizabethport. Vessels are reported scarce at Port Richmond, and freights are quoted at \$1.10@1.25 to Boston, and \$1@1.10 to Providence. There is some coal shipped from the ports in New York harbor, with freights quoted at 90c @ \$1 to Boston.

Fictitious Dividends Rebuked.

THE managers of a joint-stock company in France were recently prosecuted criminally, charged with declaring a fictitious dividend. A law of France passed in 1867, as also a law of Belgium passed in 1873, provides punishment for paying dividends made without taking an inventory, or based on a fraudulent inventory. In the case in question a company was formed with a capital of 500,000 francs, authorized to increase this capital to 10,000,000 francs. By successive issues the capital was actually raised to 5,000,000 within five months, but between the two issues dividends were declared. Complaint was made that the dividends were fictitious. The court soon decided that there were no profits that could be divided legitimately, and then it took up the question of the "good faith" of the directors, whether they were not themselves misinformed or mistaken as to the position of the company. The court found that the accounts accessible to the directors were sufficient to make them understand the true condition of the company, and that it was not reasonable to suppose that they did not understand it. The court thereupon found the directors guilty and sentenced them to imprisonment.

A GENTLEMAN of large experience in the manufacture of pig-iron has just concluded an investigation for a number of pig-iron manufacturers in the interior of Pennsylvania, of the advantage that blast-furnaces located at tidewater have over those inland. This gentleman states that a furnace at tidewater contiguous to New York harbor can save \$4.09 in making a ton of pig-iron, as compared with a furnace in the interior of Pennsylvania.

AN event unparalleled in the history of railroading occurred on the Missouri road, between Lincoln and Denver. A train of eight cars loaded with coal was blown a hundred miles by a tornado, the speed much of the way exceeding a mile a minute. They were overtaken at last by an engine, which coupled on and hauled them back.

Street-Railways.

American Street-Railway Association.

President.—Calvin A. Richards, President Metropolitan Railroad Company, Boston, Mass.

First Vice-President.—Julius S. Walsh, President Citizens' Railway Company, St. Louis, Mo.

Second Vice-President.—Henry M. Watson, President Buffalo Street Railroad Company, Buffalo, N. Y.

Third Vice-President.—Edward Lusher, Secretary and Treasurer Montreal City Passenger Railway Co., Montreal, Canada.

Secretary and Treasurer.—William J. Richardson, Secretary Atlantic Avenue Railroad Company, Brooklyn, N. Y.

Office of the Association, cor. Atlantic and Third Avenues, Brooklyn, N. Y.

The Fourth Annual Convention of the Association will meet in St. Louis, Mo., on October 21st, 1885.

COUPON TICKETS ON STREET-RAILWAYS.

AS a general rule it may be stated that street-railway fares are collected on a cash basis, and that the sale of tickets, either singly or in quantities, is not actively practiced by companies. Especially is this true in large cities where the rate of fare is generally five cents, and thus collected in the majority of cases without the necessity of making change. The simplicity of the cash system with the safeguards afforded against dishonesty by the many ingenious fare registers and bell-punches, has much to recommend it; but on the other hand there are advantages to be derived from the sale of tickets in the form of coupons, and at slightly reduced rates.

Against such reduction it may be urged that the street-railways in cities are patronized by persons riding to and from their places of business, and as they must travel in the street-cars under any circumstances, such reduction would result in a decrease in revenue without any adequate benefits derived therefrom. Such it must be admitted would be the case if these passengers were the only patrons of street-railways, which is not the case. At the most, two or three hours in the morning and evening are the only periods when such patrons may be expected, and the remaining hours of the eighteen which may be said to constitute the daily period of street-railway operation produce a different class of travelers. Possibly the morning and evening business travel constitutes the chief revenue-producing patronage of a road, but the transient and "shopping" passenger is a person of considerable importance, without whom no road could be run with profit, and it is with this individual that the coupon ticket would find a ready sale. Assuming the ordinary fare to be five cents, it is for a company to consider whether the sale of twenty-five tickets for one dollar or twelve tickets for fifty cents would be a profitable venture. In most cases we think it would; the slight curtailment of revenue experienced from the daily traveler being more than met by the increased revenue from the transient. Possession is a great incentive to use, and the ordinary individual fur-

nished with a coupon ticket entitling him to a number of trips upon a convenient street-railway would patronize that road with considerable persistency until his coupons were exhausted, when he would immediately invest in another goodly quantity. It is highly probable that he would ride two or three times under these circumstances, where he would ride but once if an actual transfer of cash were necessary on each occasion; for though five cents is but a small sum it is frequently held to be worthy of saving when a trifling walk will relieve the necessity for its expenditure. With coupon tickets these motives for economy do not obtain, and inconsequent as it may appear, the public are willing to expend ten cents in tickets where they would be loth to spend five in actual cash.

Such tickets could easily be rendered non-transferable either by requiring them to be attached to a general ticket, or by modifying them after the manner of railway commutation tickets, bearing the name of the purchaser, and punched by the conductor until the whole number of trips had been taken. Further incentive to their frequent use could be furnished in rendering them valid only for a certain number of days after purchase, thus prompting the possessor to use them lavishly for fear the period of their validity would expire before he has obtained the full number of trips; and the ingenuity of street-railway officials could meet with profitable exercise in devising further methods for increasing the patronage of their roads by means of coupon tickets sold at reduced rates. It would appear that the advisability of issuing such tickets has never been considered with the attention that it warrants, and it is quite possible that the experiment might prove a most profitable venture. If, on the other hand, it did not meet with satisfaction, the practice could be readily discontinued. Viewed in this practical light it would at least seem worthy of a thorough trial.

THE direful need of cross-town roads in lower New York City has at last received attention, and schemes are on foot to construct two street-railways of this description, one extending from the foot of Liberty street on the West side to the foot of Fulton street on the East, connecting the Communipaw and Fulton ferries; and the other extending from the foot of Chambers street on the West side to the foot of Grand street on the East, connecting the Pavonia and Grand street ferries. Such roads would be of incalculable benefit provided they could cross Broadway without hindrance to travel, but this provision will probably be a serious obstacle in the way of their construction. The off-hand generosity with which the New York Board of Aldermen conferred street-railway franchises last year has not been forgotten, and the obstreperous "property-owner" of whom we spoke last month is alert and watchful of his "rights."

OUR worthy Mayor, Mr. GRACE, has set his foot most squarely down upon measures appertaining to the whole-sale gift of city railway franchises, and has issued a ringing communication to the Aldermen on the subject. It is not likely that many franchises will be conferred for some months to come, unless the city has a fair share of the profits or a round sum for the privileges conferred, against which we have nothing to say, provided the one be not too fair nor the other too round.

* * *

It is a great pity that the recent street-railway convention was not favored with twice or thrice the number of reports of special committees that were presented, for in publishing the last installment in the December JOURNAL we sensibly appreciated our future difficulty in obtaining as valuable matter for this department as these reports furnished. Take them all in all it is doubtful if in the whole history of street-railway progress so valuable a contribution has been made to its current literature as the seven interesting reports that we have published.

THE LIGHTING OF STREET-CARS.

BY F. MARTIN GAYLER.

[Written for the AMERICAN RAILROAD JOURNAL.]

UPON reading a contribution from a "Retired Official" in the December JOURNAL, on the subject of street-car heating, I was struck by a suggestion he made therein as to the feasibility of each car being provided with a gasometer to furnish gas for a small stove that could effectually heat the car. The suggestion appears to me excellent, and the not unnatural sequence of ideas presented itself that these gasometers could also be utilized for the purpose of furnishing the illuminating power, whence the subject of street-car lighting in general comes up for consideration. When it is considered that the street-railways of this country furnish in many instances the only conveyances for daily travel to and from adjacent points, and that they are patronized daily by hundreds of thousands of passengers, there is no minor detail in their management that is not of sufficient importance to be extensively discussed; which fact was very sensibly recognized by the American Street-Railway Association, when that body appointed a special committee to consider the subject of lighting, heating and the care of cars, and to submit a report thereon. Unfortunately this report was not submitted at the recent convention, or the street-railway world would have been favored with some very useful information on the matter. Certainly a little discussion on the lighting of street-cars would be a wise expenditure of time.

I do not think I am doing street-railway managers an injustice when I say that they have devoted very little of their time and energy to the consideration of the question of street-car lighting, nor is this neglect so very surprising. As a general thing the trip of a street-car passenger lasts but a few minutes, and he is not supposed to be very

particular as to the conveniences for his comfort which the companies furnish for that brief space of time. So long as a car is clean, moderately warm and attended by polite and civil employes, the passenger is not inclined to grumble, nor should he, in truth, expect "everything for five cents." Nevertheless the expenditure of a very little trouble and money on the part of the companies would result in a considerable increase of comfort to the passenger, and in the matter of lighting we are furnished with an example of the small details towards the improvement of which the companies could direct their attention with practical benefit.

Oil-lamps are relics of a bye-gone period, and there are few conveyances, apart from street-cars and omnibuses which use them at the present day. If their use is prompted through motives of economy, such economy would seem misdirected, for though in actual money the outlay for this method of lighting may be comparatively small, the constant attention required to trim, clean and fill the lamps is considerable, and could be entirely dispensed with in the use of gas. The cost of gas to the companies, for the purposes of illumination, as stated by the "Retired Official," would not exceed a few cents per car for each hour of service, and it may safely be said that one passenger's fare would cover the expenses of a car's illumination for two or three hours. Two six-foot burners would illuminate a car efficiently, and it is easy to comprehend that the cost of such illumination for six hours would not exceed fifteen or twenty cents at the outside, and probably could be reduced still lower. With the constant improvements in the systems of electric lighting, it is very probable that a few years will see each street-car furnishing its own incandescent light, the electricity being derived from small dynamos attached to car-axes, but until this desirable period has arrived it would seem in order for gas to be utilized on street-railways as it is in Pullman coaches, and even on the ordinary passenger-cars of local trains.

A sufficiency of light in a street-car would enable the passenger to read his evening paper on his return from business during the short Winter afternoons, and such a privilege would in some instances result in an increased patronage. Certainly it would in New York City, where the crowded condition of the cars on the elevated roads might frequently induce a passenger to patronize a surface road if he could economize his time while journeying. Such literary pursuits cannot be pursued with comfort when the illumination proceeds from a couple of dingy lamps attached under the eaves of the car-roof, being also made to do double duty in sending rays of light through glass lenses for the purpose of indicating the route of the car to the outside world. Injury to the eye-sight and often to the equability of the passenger's temper is generally the result of the effort made in the face of such discouraging surroundings.

If, however, oil-lamps are to remain as the sources of street-car illumination—and it is quite possible that satisfactory reason may be advanced against their abrogation—there is no reason why they cannot be placed to more advantage than is commonly the case. An argand lamp hung in the center of the car and provided with a powerful reflector, furnishes an admirable light, and can be seen in many of the street-cars in New York. Smaller lamps could be attached to the ends of the cars behind the lenses, and a considerable increase of comfort to the pas-

senger would result. It is not so much the oil-lamp itself which meets with disapproval, as the manner in which it is used, and a central roof-lamp would in many respects answer the purposes satisfactorily. It is true that such lamps would require infinitely more attention than gas-burners, but this question is one appertaining strictly to the management of the road, and is not for the passenger to consider.

Street-car lighting may rank second in importance to street-car heating among the problems of management, but it possesses one important feature in that it is a question for *perpetual* consideration. Street-cars require heat in but four or five months out of the twelve, but they require lighting nightly, and for that reason the question of lighting is not to be dropped at intervals as is that of heating whenever Winter is over. There is little about it that is intricate, and more common sense than ingenuity is required in its perfection. The question may be resolved into two queries; first: shall oil-lamps be used for the purposes of street-car lighting? and second: if so, how can they be best and most advantageously placed? should the first query be answered in the negative, then other questions may come up for consideration, but as it seems up to the present time to have met with a pretty general affirmative answer, the only debate in order at present, is relative to the proper arrangement and disposition of the lamps, and without wishing to be reckoned a grumbler I think I am justified in saying that the arrangement and disposition at present in vogue can be greatly enlarged upon and improved.

RAILS FOR STREET-RAILWAYS.

WHEN street-railways were first introduced one of the most serious problems of construction was that relating to the shape of the rail. For railroads running through the country the T rail answered every purpose, and nothing for such use has been found to supersede it to this day. But it was necessary to lay such tracks in cities that ordinary vehicles, running along or across them, should meet with as little obstruction as possible. The old Philadelphia pattern of street-railway was first used for this purpose, and many tracks of this kind are still in existence. This is known as the side-bearing rail. During the last few years the center-bearing rail has come into general use. A cross-section of the latter is shaped like a straight-brimmed Derby hat, while that of the former is like a portion of the same figure cut off vertically. The wheel bears on the rounded edge of the crown of the hat, which gradually wears away; and the advantage of the center-bearing rail is that when this occurs it can be taken up and reversed so as to present a fresh rounded edge for the wheel to take hold of. This crown projects above the brim, or the level of the pavement, from one inch to one inch and a quarter.

A correspondent writes from Buffalo inquiring whether the height of this projection cannot be reduced, and says that if it were only half an inch high it would interfere less with ordinary vehicles attempting to cross the track or to turn out from it when an approaching car claims the right of way. The difficulty is that if the height were reduced the wheel of the car would not be able to grip the rail with sufficient firmness to keep its position on the

track. The subject has been fully considered by those who manufacture rails, and nothing better than those in use has thus far been invented.

In New York city at present nearly all the principal railways have the center-bearing rail. The Twenty-third street railroad has such a rail, weighing 47 pounds to the yard, and the following have the same kind of rail weighing 60 pounds to the yard: Dry Dock, East Broadway and Battery; Second, Third, Sixth and Eighth Avenue railroads; Broadway and Seventh avenue; Forty-second street and Grand Street Ferry; Forty-second street, Manhattanville and St. Nicholas avenue; the Belt line and the Houston, West Street and Pavonia Ferry railroad. The most difficult street-railroad to cross is that which runs through Fourth and Madison avenues, and is continued down town through Grand, Broome and Centre streets and Park Row. On this route the T rail is used because the freight-cars of the New York Central and Hudson River and the Harlem railroads pass over it on their way to and from the freight depot in Centre street.

All the railroads in this country are now using steel rails instead of the iron rails that were formerly in use. The steel rails are now cheaper as well as better than iron rails. No iron rails are now manufactured in this country. The steel rails used here are all of American manufacture. The duty on imported steel rails is \$17 a ton and ordinary American steel rails can be purchased for \$29 a ton, which is just one dollar more than the duty was a year ago, before the reduction of the tariff went into effect. If there were no duty, English steel rails would cost about \$2 less than the American article on account of the lower rate of wages in England. The "life" of a steel rail is from 10 to 20 years, according to the nature and amount of the traffic. The principal manufactories of steel rails in this country are in Philadelphia, Harrisburg, Pittsburgh and other iron centers of Pennsylvania. The manufacture at present in the United States is not prosperous. "I doubt," said an iron merchant to a reporter, "whether, with pig iron at \$19 a ton, steel rails can be turned out at \$29 a ton without the manufacturer losing money. There are about 90 rail mills in the United States. Some are idle, some are running on half time; and the industry is in a very depressed condition. The reason broadly is that the number of railroads projected and actually begun in 1879 and 1880 indicated a very heavy demand for rails, to supply which a great many new mills were started and the capacity of mills already existing was very much increased; since then railroad construction has come to a standstill and there is not the demand for rails that was expected. We have more railroads now than are needed to carry the freight, and it would be foolish to build more until these are fully occupied."—*New York Tribune*.

ELECTRIC MOTORS ON THE BROOKLYN BRIDGE AND THE ELEVATED ROADS.

THE Daft Electric Company has begun to deliver rails on the Brooklyn Bridge to be used in making experiments with an electric motor for running cars from New York to Brooklyn. The dynamos are now ready, and before Spring the company hopes to have its motors running. The experiments will be carried on at first between midnight and early morning; as soon as the motors work

smoothly, cars will be sent over the bridge during the day between the regular trains drawn by the cable. The new rails will be laid about a foot from the cable and will not interfere in any way with the present working of the railway system now in use. The electric system to be used will resemble that employed by the Daft Company on the Iron Pier at Coney Island last Summer.

The Manhattan Elevated Railroad has as yet taken no decided steps toward making the experiment of running their cars by electricity, but it is understood that Mr. Cyrus Field has the project at heart, and will probably succeed in obtaining the directors' consent to the experiment on the Second Avenue line, where traffic is least important. The companies invited to share in the expense of the experimental equipment and prove the value of their devices are those controlling the Knight-Bently system, Edison system, Field system, and Daft system. Messrs. Edison and Field some time ago agreed to pool their interests in the electric motors, and although since then there have been some legal disagreements between them they will probably act in harmony in the elevated railway experiments. Mr. Edison, as is well known, has been working at the problem of propelling cars by electricity for a number of years, and has built an experimental road nearly a mile long at Menlo Park. He abandoned his experiments when the business importance of the lamp became apparent and has not had time since to resume them. Mr. S. D. Field claims that his patent, not yet issued, but which he is confident of soon getting, after five years' litigation, covers the whole ground of electric motors, and that all the patents granted to Edison, Daft, and others can be for minor devices only. His chief contest in the Patent Office has been with the American representatives of the European inventor, Siemens, who had an electric railway in use in 1878 at the Paris Exhibition, and has since established several short lines in different parts of Europe. So far Mr. Field has been successful in upholding his claims to a patent in our Patent Office and the final decision of the Commissioner of Patents is now awaited. One of Edison's most important patents in this department covers a device by which a separate motor is attached to each car, thus making each car independent, allowing trains of any length to be made up, or single cars to be run.

A well-known expert in electrical matters, when asked as to the radical differences between electric motors, said: "There are none. The one type of motor of which all motors are copies more or less close is an ordinary dynamo machine. The so-called systems claimed by various persons differ only in details of the motor or in the methods of conveying the current from the dynamos to the motors. Some persons use one rail on the ground and a wire in the air; some use both rails; some carry it all on wires overhead. The Cleveland electric road built by the Knight-Bently Company places its wires in a trench between the tracks somewhat similar to the trench used for cable roads. A longitudinal slit allows communication to be maintained between the motor on the track and the wires in the trench. The Field patent claims the system of sending a current generated by a steam dynamo through the rails or through an auxiliary rail. If electricity should come into general use for propelling railroad-cars, there will be a very pretty crop of patent suits; several experts will have a chance to grow rich. As the

matter stands now, each inventor claims for his system every protection, and questions the right of all other electricians to anything whatever.

"As to the probability of electric motors being generally used on the elevated roads within the next year or so the best judges do not expect anything of the kind. A steam locomotive on the elevated roads uses only about 25 per cent. of its steam power; from a stationary engine 90 per cent. of the steam power can be used in a dynamo. The dynamo will transmit perhaps 50 per cent. of its power to the motor, and there is therefore, an apparent saving of power. This would be all right if there was no leakage of electricity. But the leakage is tremendous, and accidents by which current is lost are too common."

Steam Power on Street-Railways.

STREET-RAILWAYS worked by steam, for the most part carrying freight as well as passengers, have become a very important part of the communication of some European countries of late years. In Italy, especially, they flourish. In Holland a recent report shows that there are in all 326 miles of street-railway in 33 different lines, 17 of which are worked exclusively and four partly by locomotives, of which there are 131 in street-railway service, besides 1,303 horses, 8 mules, 615 passenger-cars and 252 freight-cars. The average cost of the Dutch street-railways has been about \$20,900 per mile. They are mostly laid with T rails, except where actually on the turnpike.

Street-Cars in Mexico.

THE street-cars are run in trains in Mexico. Instead of one car leaving the terminus every ten minutes, three cars are sent together every half-hour. This is not a measure of economy, writes a correspondent of the *Chicago Inter-Ocean*, for each car has two mules attached, and, although they are never more than half a block apart, there are always two conductors besides the driver. One conductor takes the money and gives you a ticket, and the other comes around, punches it in the presence of the passenger, and puts it in his pocket. They are supposed to be a check upon each other. The street-car drivers always carry a horn, and blow it as they approach a street crossing, so that there is a perpetual tooting going on. The conductors usually carry revolvers. I don't know why, except that it is the fashion, for a Mexican would as soon go out of doors without his hat as without his revolver.

A Street-Railway for Sale.

THE Lampasas Street-Railway, of Lampasas, Tex., is advertised for sale on Feb. 3d. This road is constructed as follows: T rail 22 and 25 lbs. to the yard, about thirty-two hundred red cedar ties to the mile, with six cars built by Messrs. Brownell & Wight, of St. Louis, Mo., last Winter, gauge of road four feet and one-half inches, (standard) total miles three and one-fifth. City franchises give right of way to all streets and alleys for fifty years, also exclusive right of way through the extensive Park grounds of the Lampasas Springs Co., extending to the grand Park Hotel and Hancock springs. The city has grown from 500 to 5,000 inside of three years, and is the county seat of Lampasas county, destined to be the Saratoga of the South.

The two springs Hancock and Hanna, are situated on the main line of the street-railway one and a half miles apart. The main street-car line is two and a half miles long, running from the Passenger and Freight Depot, via Hanna springs; court house square, principal hotels and main portion of the city, thence to the Park hotel and Hancock springs; the road is bonded for twenty thousand dollars for ten years, bonds bearing 8 per cent. interest payable semi-annually. The road can be bought at private sale between this and the third of February, on good terms, or one half interest can be bought for six thousand five hundred dollars, with four thousand dollars cash payment, balance in equal payments, twelve and eighteen months, with interest.

A New Electric Street-Railway.

SIMULTANEOUS experiments with cable railroads operated by steam power and electrical railroads naturally suggested to many inventors a combination of the two systems. The central underground tube is made to carry a fixed electrical conductor instead of a moving wire rope, and connection is made between the motor and the conductor through the slit in the tube. An electric railway on this principal has been built for experimental purposes at Manchester, England, and is said to work satisfactorily even in rainy weather. The improved contact due to moisture is supposed to make up for the loss by leakage. In this system the running rails of the road are used as return conductors. Leather straps are used to draw the connector through the tube. They serve to clear the passage way of ordinary obstructions, and if they should meet with too much resistance, would give way, breaking the connection and stopping the car before much damage was done. The straps can be easily and cheaply replaced.

A Cable Road in Lisbon.

A CABLE road has been laid in a Lisbon (Portugal) street up an incline of 1 in 4 for a distance of 560 feet. The cable is carried underground, as in our cable street roads of San Francisco and Chicago. The inclination is quite uniform, but the road makes an S curve. The road is worked with water, counter-balancing the weight of the car going up, but is arranged to be worked by steam in case the supply of water should be interrupted. In the first trials of the road a hemp cable was used, and, to test the automatic brakes used, this cable was cut while ascending the incline. The brakes stopped the car within a distance of ten feet. This road is the design of the Swiss engineer Riggensbach, who is well known as the designer of a mountain railroad in Switzerland.

A Street Cable Company.

THE American Cable Traction Company is the title of a new company incorporated by S. S. Battin, A. Q. Keasbey, G. G. Frelinghuysen and John H. Ballantine, of Newark, N. J., C. B. Thurston and James B. Vredenburgh, of Jersey City, Royal M. Bassett, of Birmingham, Ct., John C. Barron, of Tarrytown, N. Y., Thos. F. Stevenson, of Brooklyn, and J. Richardson, of New York, for the manufacture of cables and machinery for street-railways and

the operation and control of the same. The capital stock is \$100,000, divided into 1,000 shares of a par value of \$100 per share; capital paid up \$6,000.

Returned by a Car Conductor.

A FEW days ago, President Thurston, of the Bayonne Horse Railroad Company, of Jersey City, received the following letter:

Thomas M. Sayre, Supt. J. C. & Bergen Horse Car Co.

SIR: I herewith enclose fifty dollars (\$50) which you will turn into the treasury of the J. C. & Bergen Horse Car Company, of which you are Superintendent. The above money was collected by me and retained unlawfully while in the employ of the company.

Yours,

EX-CONDUCTOR.

A \$50 bill accompanied the letter, which was placed in bank as the nucleus of a conscience fund.

Ventilation of Cars.

[COMMUNICATED.]

Office of JOHN STEPHENSON COMPANY, New York, Dec. 29, 1885.

Editor American Railroad Journal:

Your issue of November has an article headed "Car Awnings," with: "Complaint is made in Mexico of the extreme heat often prevailing in the Pullman cars, caused . . . by the fierce rays of the tropic Summer sun beating down on the roofs and heating the cars like ovens, etc."

In street-cars we have found like difficulty, though increased by foul air from the greater number of passengers in small space. Our remedy has worked well in street-cars, and there is good reason why it should work even better on steam-railroads where the high speed would tend to exhaust the air from the car more readily.

The "Loughin Patent," which we use, is a double roof to the car-body, or rather a ceiling below the roof, having a space between the ceiling and the roof, the ceiling finely perforated, through which the air passes, making its exit from the car at the open verges of the roof and carrying with it the refracted heat of the roof. As air passing through gauze does not move in columns but is broken into spray, offensive currents are avoided. Five years' experience in our cars has established utility of the system.

JOHN STEPHENSON.

STREET-RAILWAY NOTES.

THE directors of the New York and Brooklyn Elevated Railroad Company have voted to consent to a first mortgage on the franchise and property of the company, and to authorize a contract for the construction of the proposed road from the Grand Central Depot in New York to various outlying points in Brooklyn, using the bridge as the connecting link between the two cities. The company claims to be the lessee of the Brooklyn Elevated and Atlantic Beach, the Brooklyn and Coney Island Central, and the Brooklyn City Elevated roads, and to have a capital of \$11,500,000, of which \$1,600,000 has been subscribed.

THE plan of using the enormous water power of the Alps for working electric railways in Switzerland is about to take a definite shape, the idea being to connect the towns of St. Moritz and Pontresina by an electric railway four and three-quarter miles long, the motive power to be supplied by the mountain streams; the line, in case the plan proves a success, to be extended a considerable distance.

THE St. Elmo Railway Company of Chattanooga, Tenn. is about to construct a line of street-railway, and the Chattanooga Street-Railway of the same city will construct another line.

New Inventions.

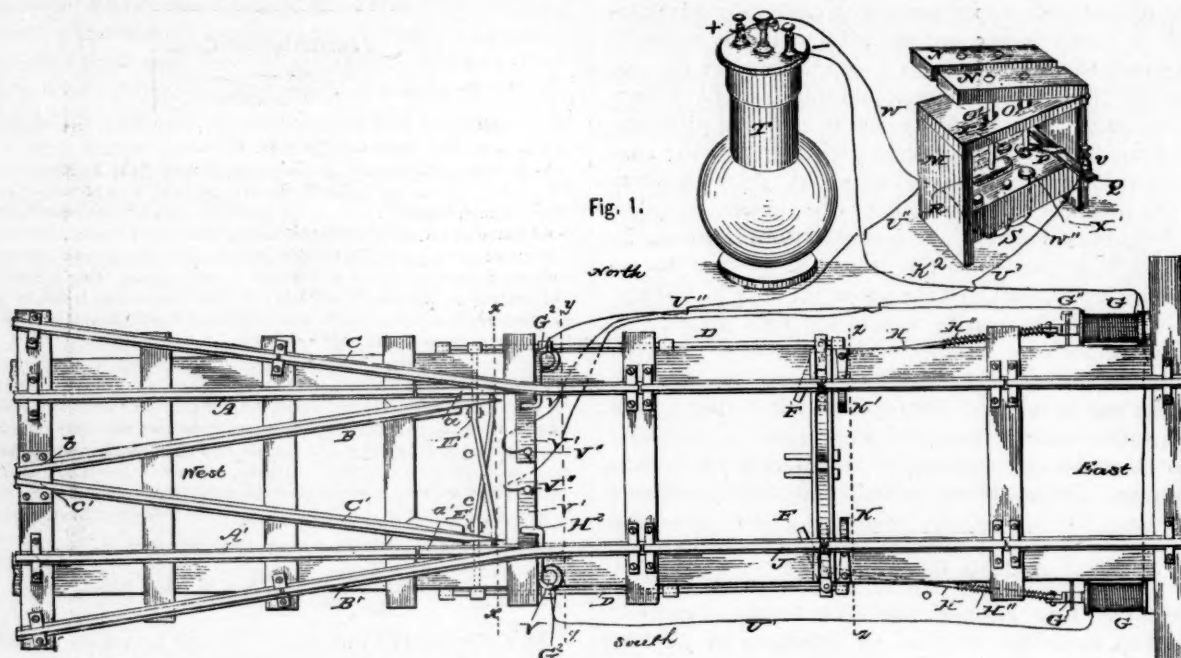
Marshall's Dynamo-electric Railway Switch.

MARTIN MARSHALL, of Jamestown, N. Y., is the inventor and patentee of a dynamo-electric railway switch which is herewith illustrated and described.

The invention has reference to that class of railway switches which are operated automatically by the passage of the cars over the track; and it consists, mainly, in an electrical controlling device whereby an operator may cause a train passing over the track to operate or actuate any one of several switches, thereby causing the train to take the desired direction. The invention further consists

and south rails of two switches, the other rails of which are pivoted at $c' b$, and are designated by C' and B' respectively.

J indicates a jointed portion of the rails of the main track, at which two short rails, $A^2 A^2$, are hinged in such a manner that their free adjoining ends are capable of moving vertically. The said adjoining ends are connected by means of a T-shaped plate B^2 , the head of which is provided with slots to receive the pivoting-pins, while the shank of the plate is pivotally connected with a T-shaped lever I , pivoted to one of the sleepers near the center of the track. It will be seen that the construction is the same at the north and south rails. The free ends of the jointed rails are normally held in a raised position by means of suitably-arranged springs K . $D D$ are rock-shafts arranged alongside the track, adjoining the rails of



MARSHALL'S DYNAMO-ELECTRIC RAILWAY SWITCH.

in automatic devices for releasing the switches immediately after the passage of the train, thus opening the main line, and also in the improved construction, arrangement, and combination of parts for effecting the above results.

In the accompanying cuts, Fig. 1 is a plan view of a track and switches embodying the improvements, showing also the electrical conductors, and showing in perspective a battery and the circuit-controlling device; Fig. 2 a transverse sectional view on the line $x x$ in Fig. 1; Fig. 3 a transverse sectional view on the line $y y$ in Fig. 1; Fig. 4 a perspective view, on an enlarged scale, of the circuit-controlling apparatus; Fig. 5 a transverse sectional view on the line $z z$ in Fig. 1, and Fig. 6 a detail view in perspective of the hinged adjoining ends of the raised portion of the railway track. The reference-lettering is similar throughout all the cuts.

A^1 designate, respectively, the north and south rails of the main track, at the termini of which are hinged short switch-rails a^1 , which normally connect the rails with the continuation of the main track, the rails of which, at the switch, diverge respectively in a northerly and southerly direction, as at C and B' , so as to form the north

the main track. The ends of these shafts, which terminate at the rail-joints J , are provided with arms or cranks C^2 , to which plates F are pivotally attached. These plates are provided with loops or staples D^2 , connected by pivoted rods H with the spring-armatures G'' of electromagnets G , located at the sides of the track.

H'' are traction-springs coiled around the said connecting-rods, and attached to the upper ends of the armatures and to the sides of the track, for the double purpose of keeping the spring-armatures normally off from the magnets and keeping the swinging plates F from under the T-levers I . The proportional arrangements of these parts, however, are such that when the armatures are attracted by the magnets the plates F shall swing under the T-levers I , so that when the rail-joints J are depressed by a passing train the T-levers shall descend upon the plates, thus vibrating the rock-shafts. The ends of the rock-shafts, which terminate at the switch, are provided with arms E , connected by links E' with the switch-rails B and C' , respectively, the free ends of the latter being mounted upon pivoted links or rods E^2 , mounted upon a cross-piece F^2 , below the main track. The switch-

rail B is connected by a rod or brace *c*, with the switch *a'* of the south main-line rail A', and the switch-rail C' is likewise connected with the switch *a* of the north main-line rail A. It will thus be seen that when the northern rock-shaft is vibrated the effect will be to throw the switch-rails B *a'* in a northward direction, thus opening the southern switch or siding, while when the southern rock-shaft is operated the switch-rails C' *a* will be thrown southward, thus opening the northern siding for the passage of trains.

In the office of the operator whose duty it is to control the switches, is arranged a battery T, and a key-board or

binding-screws V". The outer or free ends of the springs V' extend nearly to the rail-flanges, and occupy such a position that they shall be engaged by the wheel-flanges of passing trains and be thrown out of engagement with the keepers V.

It has been stated that the magnet S is connected directly with one pole of the battery T. The other pole of the battery has a double or twisted wire or conductor K², the branches of which are connected each with one end of the winding of one of the electro-magnets G, arranged at the sides of the track, as before stated. The magnet G at the south side of the track is connected by a wire or

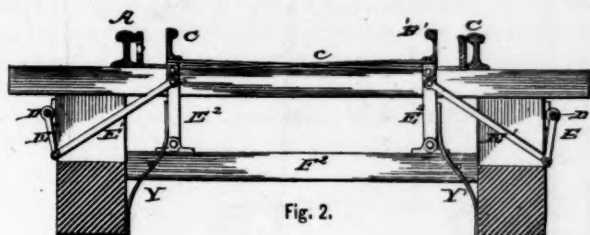


Fig. 2.

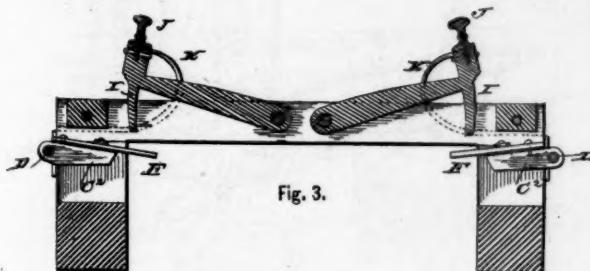


Fig. 3.

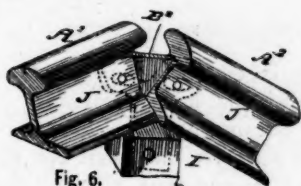


Fig. 6.

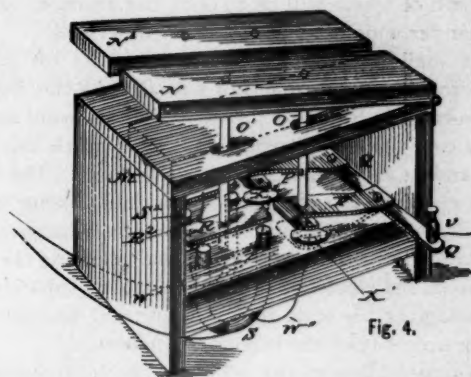


Fig. 4.

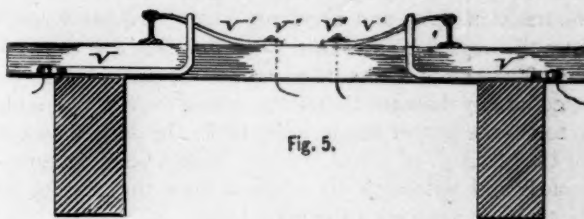


Fig. 5.

MARSHALL'S DYNAMO-ELECTRIC RAILWAY SWITCH.

frame M. The latter contains two electro-magnets S S², the armatures of which are connected by rods O', with the keys N' N², that are hinged to the upper part of the frame. These keys are also provided with rods O, arranged to bear upon spring conductors or cushions P P², the double function of which is to keep or sustain the keys normally in a raised position and to touch the contact points X' X² when the keys are depressed.

The windings of the electro-magnets are connected, respectively, as follows: One end of the winding of magnet S is connected with one of the poles of battery T, and its other end with the contact-point X'. One end of the winding of magnet S² is connected with the binding-screw V" of a circuit-breaker, and its other end with the contact-point X². The springs or cushions P P² are mounted upon a bar Q, of copper or some other good conductor of electricity, one end of which is provided with a binding-post v.

V V are well-insulated keepers secured at the sides of the track near the switch, and having loops G² and arms H², which latter serve as contact-points for the springs V', which are secured to one of the sleepers by means of the

conductor U', with the loop of the keeper of the circuit-breaker at the south side of the track, the binding-screw of which is connected by a continuation of the said conductor U' with the binding-post v of the bar Q. The northern magnet G is connected with the keeper of the northern circuit-breaker, the binding-screw of which is, as has been already stated, connected with one end of the winding of the electro-magnet S².

The switches are held in normal position for keeping the main track open by means of suitably-arranged springs Y Y', as shown clearly in Fig. 2 of the drawings.

The operation of this invention is as follows: Under normal or ordinary circumstances the main line is always open, so that a train running in either direction would continue upon the main line if the electric keys were not disturbed. Now, suppose a train to be coming from east to west, and it shall be desired to switch it off upon the northern siding. The operator will then depress the key N of the electro-magnet S of his instrument, thus closing the circuit, which is as follows: From one end of the winding of magnet S to the pole of the battery T, which is marked +, from the other end of the winding of said

electro-magnet to the contact-point X' , thence through the contact-spring P , bar Q , binding-post v , and conductor U' , to the circuit-breaker V' at the south side of the track, through the keeper of the same, and to the electro-magnet G at the south side of the track, through the windings of the same, and to the pole of the battery marked —, thus completing the circuit, the effect of this being to convert the electro-magnets S and G into active magnets. The former will retain its armature and the latter will attract and retain its armature G' , thus drawing the pivoted plate F under the T -lever I . When the train passes, it will depress the raised jointed portion J of the track, thus causing the T -lever I to strike the plate F and vibrate the rock-shaft D at the south side of the track, the result of which will be to open the northern siding, in the manner which has been already described.

If it shall be desired to switch a train off upon the southern siding, the operator will depress the key N^2 of electro-magnet S with a precisely similar result, save that in this case the electro-magnet G at the north side of the track and its attachments will be influenced. The flanges of the wheels of the rolling-stock in their passage will depress the springs V' which form the circuit-breakers, thus automatically breaking the circuit and releasing the armatures from the electro-magnets, so that immediately upon the passage of the train the main line will be open, without the necessity of the care of attendants.

The construction of the device is simple, and it may be applied to railway-switches without any considerable expense. Under all ordinary circumstances the main line of the track is open, and accidents which frequently result from the neglect or mistakes of switchmen are impossible. The switches may be controlled by an operator located at any distance therefrom, whose duty it is simply to touch the proper key in order to set the desired switch for the passage of trains, the said switch being instantaneously and automatically released upon the passage of the train, so as to open the main line.

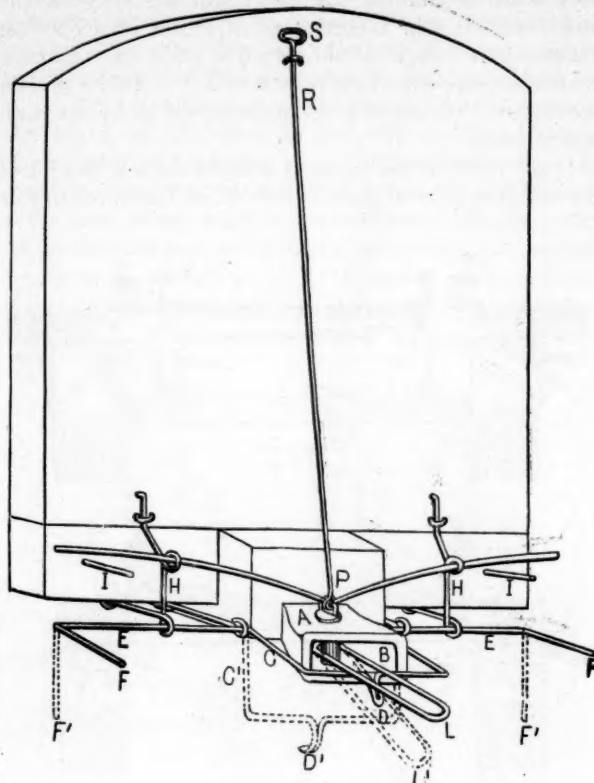
Owen's Safety Coupler.

LUTHER B. OWEN, of Cedartown, Ga., is the inventor and patentee of a safety car-coupler, which is herewith illustrated and described.

The accompanying cut shows the end of a freight-car with the coupler attached. A is a draw-head of the usual construction, provided with the slot B to receive and hold the link L . By the side of the draw-head is attached a loop or crank C , furnished with a curved tongue or projection D , the loop or crank extending in either direction to the sides of the car, in the form of rods $E E$, which are at their extremities bent into cranks $F F$. By raising either of the cranks $F F$, the loop or crank C is also raised, which in turn will raise the link L to meet the draw-head of the approaching car. The curved tongue or projection D , being struck by the draw-head of the approaching car, the loop or crank C is forced downwardly and backwardly, till it assumes the position C' , shown in outline, and when not coupled the link occupies the position shown in outline at L' .

The pin P is attached to a rod K , extending to the top of the car where it is furnished with a handle S . To the link are further attached rods $H H$, passing through eyes

at $H H$, and when the pin is raised, these rods fall upon projections on the end of the car, one of which is shown at I , the contact of the rods with these projections occur-



OWEN'S SAFETY COUPLER.

ring before the pin is removed from the draw-head, thus preventing its removal and misplacement.

It is claimed by the inventor that this device is simple in construction, inexpensive, and that all necessity for going between the cars, and thus exposing the person of the train-hand to injury is entirely avoided. Cars employing the device can be coupled to cars provided with the ordinary link and pin, and it can be attached to any car without structural change and at small cost.

The coupler is owned and controlled jointly by the patentee and by Miller A. Wright, of Cedartown, Ga.

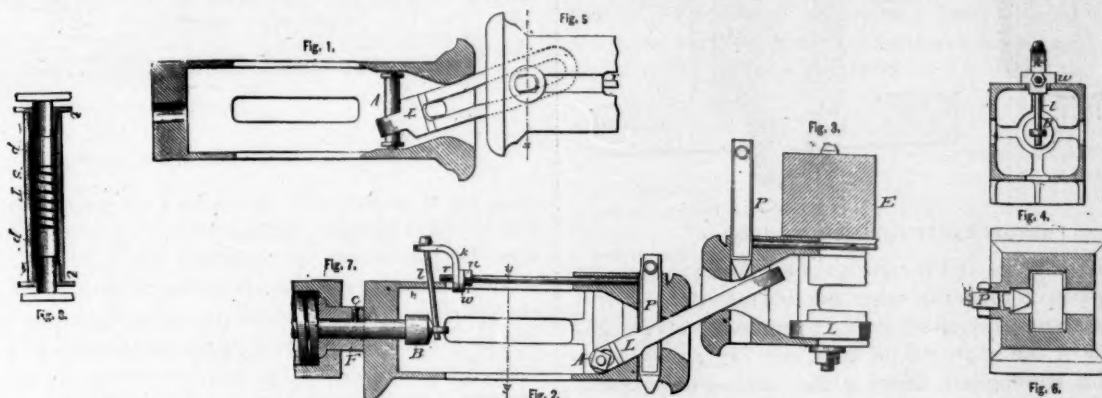
Randolph's Car-coupling.

RICHARD RANDOLPH, of Rockville, Md., has invented an improvement in car-couplers which is fully illustrated and described in the accompanying cuts and description.

Fig. 1 is a horizontal longitudinal section of the casting for the draw-head with a top view of the link L and its attachment A , showing their position when there is a maximum horizontal deviation of the two draw-heads to be coupled, and showing the form of the link, the loop of which is smaller at the back end than at the front to prevent the pin being raised through this end when the other end is connected with another draw-head. Fig. 2 is a vertical longitudinal section of the casting with a side view of the link and its attachment, showing their position when there is the maximum vertical deviation of the two draw-heads; also with a side view of the apparatus l, k, w ,

n and r , for clamping the pin P and holding it in an elevated position until released by the pressure between the two draw-heads; also with a side view of the draw-bolt B , having a projection from its head, which operates the clamping apparatus, and showing the play between the head of the bolt and the casting. Fig. 3 is the front end of the same section as in Fig. 2, showing the casting drawn forward, as allowed by the play between it and the head of the draw-bolt, and resting upon the plate f , by which it is suspended from the end-sill E , of the car, also showing the pin as held in the elevated position by the pressure of the rod r , of the clamping apparatus shown in Fig. 2, and the position of the link L as stored within the casting when not in service. Fig. 4 is a transverse section of the casting and of the rod at the line yy in Fig. 2, showing the back end of the casting on the inside and the bearing of the head of the draw-bolt; also a front view of the clamping apparatus, showing the projection

the link, and which present shoulders on the inside of the tube, to prevent the escape of the pistons or plugs p , which are forced apart by the spiral spring ss between them, and which play through the taps, but which are limited in their play by the shoulders upon their inner ends. The tube, with its contents, is attached to the link by the hand introduced into the casting through the opening in the under side, when the other openings are closed by the timbers, and then screwing in the taps with a wrench. When two draw-heads are to be coupled, in one the pin is raised and the hand inserted through the mouth and the link drawn fully forward with the pin restored to its position. The attachment will be drawn forward with the link without friction until it reaches the point where friction is required. This is where the interior width of the casting is reduced sufficiently to compress the spring within the tube to an extent which produces the required friction between the sides of the cast-



RANDOLPH'S CAR-COUPLING.

from the head of the bolt through which passes the lever l , and the washer w , which sustains the apparatus upon the casting. Fig. 5 is a top view of the front end of the casting, showing the form of the pin-hole at the upper side and that of the upper end of the pin within the hole; also the ridge in the middle which protects the rod r , that plays through it longitudinally. Fig. 6 is a transverse section of the casting at the line xx in Fig. 5, showing the lateral contraction of the pin-hole at the top, and with a front view of the two ends of the pin, showing how it is confined to the casting by the shoulders on the sides of the pin at the lower end and by the small bolt riveted through the upper end after it is inserted from below. Fig. 7 is a longitudinal vertical section of the front end of Butler's patented spring-buffer, showing the front follower-sleeve F , in which sleeve is inserted a small screw c , which projects slightly into a groove of corresponding depth made in the draw-bolt B , the groove corresponding to the forward play of the bolt through the sleeve, the object being to insure the play between the head of the bolt and the casting required for deflecting the lever l backward. Fig. 8 is a longitudinal section and view of parts of the attachment A to the link, drawn on a scale two and one-half times greater than that of A .

The parts represented in Fig. 8 are the tube T and the taps t , which are screwed into each end of the tube, and which have square collars projecting beyond the tube, to retain it within the slotted eye at the back end of

ing and the outer ends of the plugs, the tube being nearly at right angles to the sides, a position into which it can easily be forced by the manipulation of the link. Then the link will remain in any position in which it may be set, to correspond with the deviation of the draw-heads, and which may be determined by the eye. The friction of the attachment will also provide a sufficient resistance to overcome any legitimate resistance to the link at its front in gliding into the opposite draw-head, but will yield without injury to any other obstruction, and the link will retreat out of harm's way. The pin of the other draw-head is then raised to the full extent, and the link, if protruding, pushed back into the casting, which is now drawn forward until a pressure is brought upon the buffer-spring from behind. This deflects the lever l in Fig. 2, which transmits the pressure from the upper end of the lever through the knee k and the rod r , which is screwed into the knee, and thence at the front end of the rod to the pin. This pressure is sufficient to hold the pin in the elevated position, and the pressure will be maintained by the friction of the casting as it rests upon the plate f in Fig. 3. As soon as a pressure is exerted between the two draw-heads in their approach the lever is pushed back, carrying with it the rod. Thus the pin is released at the moment the link is in the proper position to receive it in falling. In the lever and the rod there is sufficient elasticity to yield to any play that may remain between the casting and the head of the bolt after the rod is made to

clamp the pin. This residuum of play is reduced to a minimum by revolving the rod in the proper direction, screwing it through the knee *k*, and the adjustment is maintained by the jam-nut *n*.

Heston's Improved Piston-packing.

WILLIAM HESTON, of Alliance, O., is the inventor and patentee of an improved system of piston-packing, which is herewith illustrated and described. The invention is especially adapted for use in the stuffing-boxes of steam



Fig. 1.

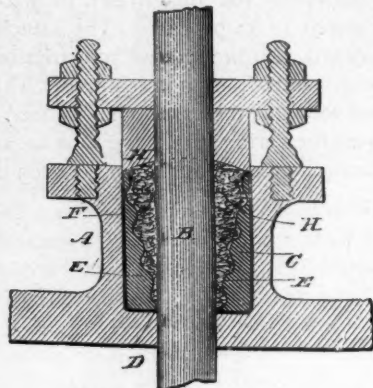


Fig. 2.

HESTON'S IMPROVED PISTON-PACKING.

and other engines, and it consists of an elastic corrugated packing-cup of rubber or other suitable material.

In the accompanying cuts, Fig. 1 represents a perspective view of the improved packing, and Fig. 2 a sectional view of a stuffing-box showing the packing in position. The reference-lettering is similar throughout the two cuts.

A denotes the stuffing-box, and B the piston. C is the packing, which is in the nature of a cylindrical cup, as shown in Fig. 1, with a circular hole D, in the bottom, adapted to fit around the piston. The inside of this cup forms an inverted cone, with ribbed or corrugated sides, as shown at E, the thickness of the corrugated rubber wall decreasing in thickness from the central aperture D, toward the upper edge. The exterior of the cup may be protected by a lining or casing F, of duck, canvas, or similar material.

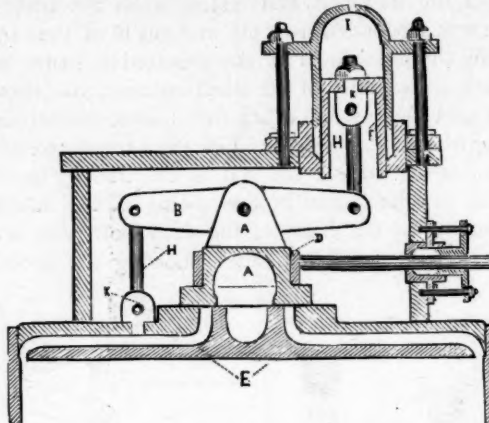
In using this packing the cylindrical cup is placed in the stuffing-box, as shown in Fig. 2, and the space between its corrugated inside and the piston is packed with loose hemp, as shown at H. This hemp should be loosened and dampened and packed into the cup snugly and tightly all around the piston, and if it should be found to leak at any time more hemp may be added, and thus effectually prevent leakage without the necessity of screwing up the gland. The horizontal corrugations E on the inside of the cup will prevent the hemp from working out of the same by the reciprocations of the piston, thereby at all times holding the inside hemp-packing firmly in its proper position.

Bewsher's Balanced Slide-valve.

JAMES BEWSHER, of Kansas City, Mo., is the inventor and patentee of a balanced slide-valve, of which an illustration is herewith given. The inventor claims for his

device that it will accomplish everything possible by an automatically balanced slide-valve, and that there is a saving of ninety per cent. of power required to work the slide-valve, an economy of steam, and a great saving of the wear and tear of the working parts.

A A is the slide-valve with lugs on top; B is an equalizing beam or bar pivoted to the valve at the center; H H are two links, one end of each being pivoted to the equal-



BEWSHER'S BALANCED SLIDE-VALVE.

izing bar at its end, and the other ends pivoted at K K; F is a hollow plunger, packed with any preferred packing used on piston rods, etc., where a gland is used; D is a section of the valve-yoke; E are steam ports to the end of the cylinder. The top of the gland forms an arch to keep dirt from getting into the working parts, and has a small hole in the top to allow the steam to escape in case of any leakage. Its operations are as follows: As the valve reciprocates, the beam also reciprocates; the ends of the links connected to the beam, also reciprocate, and as the links at the other end have stationary connections, the links describe an arc, in opposite directions to each other—hence the beam has a parallel motion at the valve. The pressure of steam being only on the plunger, on the side next to the steam-chest, it has a lifting power equal to its area multiplied by the pounds of steam, and is resisted by the valve, and relieves the valve of its heavy load, due to the power of the piston.

The slide-valve is automatic, and rigidly connected, and is not affected by expansion nor contraction, while no springs nor adjusting screws are necessary. The wear upon the valve is claimed to be nominal as the great friction is practically transferred to the links, and what little wear there is, is taken up by the piston, making it self-adjusting.

Scale in Steam Boilers.

A VERY useful discovery was recently made in California of a process for removing scale from steam boilers, and like many other discoveries was the result of accident. Mr. George Downie, the proprietor of a flouring mill at Salinas City, was in the habit of filtering water in an old heater in order to free it, as far as possible, from the impurities that formed the scale in his boiler. After running the water through the heater he let it drain through straw. One day, being out of straw, he gathered together the leaves of a Eucalyptus tree that stood near the mill and used them instead. He was surprised on finding

soon after that not only had the formation of scale been stopped, but that the scale already in the boiler had been removed. He continued experiments and imparted his discovery to others who have subsequently introduced the extract made from the leaves of the tree in the form of a dark brown liquid, on boilers all the way from San Francisco to New York, and are meeting with great success. The manufacturers of this article claim that the extract, aside from its ability to remove the scale, preserves iron from rust. This extract is obtained by boiling the leaves of the Eucalyptus tree in steam boilers under a pressure of steam.

Preserving Railway Sleepers.

At the recent convention of the German Railway Union, a report on preserved sleepers was presented, which was supplementary to a previous report published some years ago. Of the railways answering the circular of inquiry sent out by the committee, thirty-four used preserved sleepers now, against twenty-four in 1868. The number of railways using each of the methods of preservation in 1865, 1868, 1878, and 1884 was:

	1865.	1868.	1878.	1884.
Sulphate of copper.....	15	6	5	1
Sulphate of iron and zinc.....	1	—	—	—
Sulphate of barium and oxydul of iron.....	2	—	—	—
Corrosive sublimate.....	3	6	8	4
Chloride of zinc.....	8	7	20	22
Creosote.....	4	5	13	11
Chloride of zinc and creosote mixed.....	—	—	4	7
Vapor of creosote, Paradis' patent.....	—	—	—	1
Vapor of creosote & creosote (Blythe's system).....	—	—	1	1
Antisepticum under pressure.....	—	—	—	1

Thus sulphate of copper, which was the prevailing method used in 1865, is now used by but one railway, but the use of chloride of zinc has extended until it prevails, and alone or in combination with creosote is used by twenty-nine out of forty-eight railways which use any preservative. Creosote alone, however, is still extensively used, though less so than in 1878.

The Westinghouse Brake in France.

THE Western Railway of France was the first French road to adopt the Westinghouse brake and has now in use 3,057 cars equipped with that brake. This road connects Paris with Versailles and the shipping ports of Western France. The following record is given of accidents prevented by the use of the air-brake on its lines:

1880 to 1884, six collisions avoided.

1879 to 1884, ten cases of persons crossing the line outside stations.

1879 to 1884, seventeen cases of persons crossing the line inside stations.

1879 to 1882, three cases of obstacles, such as horses and carts, etc., unexpectedly found on the line.

1880 to 1882, six cases of rolling-stock standing on the line, or being shunted, and not removed in time. Total, forty-two.

Making Railway Travel Safe.

AN apparatus has just been invented, says the Paris *Gaulois*, which is simply astounding, for with it the traveler need no longer fear any accidents. Safety will be assured on railways. This apparatus permits the employé charged with the duty to see in a mirror, the entire section

of the road he is to control, with all the trains in motion, and he knows at every instant just exactly where each train is. When one of them approaches another at a distance which is dangerous, he can immediately signal the menaced train. The apparatus consists of a sheet of opaque glass, on which the rails are indicated by horizontal lines and the stations by vertical ones, numbered. Little arrows, representing the trains, move along the horizontal lines. They are put in motion by aid of electricity, developed by the contact of metallic brushes attached to the locomotives with zinc bands placed along the rails. The train thus continually traces its trajectory on the glass indicator. The apparatus was exhibited some days ago in Germany to a commission of Berlin scientists.

Patents Industrially Classified.

A TABLE prepared by Commissioner Butterworth shows that of the nearly 300,000 patents issued by the Government, the various lines of machinery and industries have received the following number:

	No. Patents.
Applications of electricity.....	5,872
Artesian wells.....	500
Beds.....	2,150
Boots and shoes.....	5,060
Bread and cracker machinery.....	440
Chairs.....	1,580
Corset patterns.....	969
Dairy utensils.....	2,429
Fences.....	2,888
Fire engines.....	567
Fire escapes.....	884
Harvesters.....	6,606
Lamps and gas fixtures.....	5,254
Laundry utensils.....	4,993
Machines for knitting.....	754
Metaling.....	3,814
Metal working machines.....	10,203
Methods of tanning hides.....	1,210
Mills and thrashing.....	6,740
Nut and bolt locks.....	734
Plows.....	6,889
Pumps.....	3,156
Railways.....	3,508
Railway cars.....	3,505
Seeders and planters.....	3,568
Steam engines.....	5,111
Stoves and furnaces.....	8,238
Vegetable cutters.....	450
Water distributors.....	3,719
Wearing apparel.....	2,417

These aggregate 104,217, or a little over one-third of the entire number of patents issued.

The First Patent.

THE first patent granted to an inventor in the United States is mentioned in a speech of ex-Senator Wadleigh of New Hampshire, in the Forty-fifth Congress. The Senator said: "An intelligent gentleman of my own State has referred me to an Act of the general court of Massachusetts Bay passed in 1646, granting to one of his ancestors, Joseph Jenks, the exclusive right of making and selling his improved scythe for the term of fourteen years. That, I think, was the first patent granted to an inventor in America. The improvement referred to changed the short, thick, straight English scythe into the longer, thinner, curved implement with stiffened back now in use."

GEO. H. HOWARD,
Counsellor in Patent Causes and Solicitor of
Patents.

IN PRACTICE SINCE 1871.

Washington Correspondent of the Western Railroad Association since 1879.

635 F STREET, N. W., WASHINGTON, D. C.

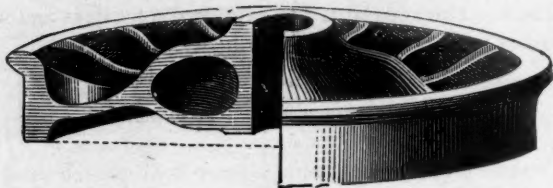
VALVE-OLEUM.

E. F. DIETERICH'S

Cylinder, Engine and Machinery Oils
CLEVELAND, OHIO.

Patented 1874, '75, '76, and July 4, 1882.

Ramapo Wheel and Foundry Company.



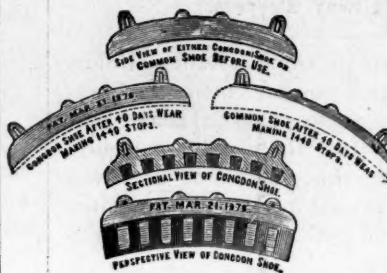
MANUFACTURERS OF

STEEL TIRED and CHILLED IRON WHEELS

For Drawing-Room and Sleeping Coaches, Locomotives,
Tenders, Passenger and Freight Cars.

W. W. SNOW, Superintendent and General Manager.
RAMAPO, Rockland Co., N. Y.

CONGDON BRAKE-SHOE.



This improvement consists of a brake-shoe having imbedded in its body of cast iron, pieces of wrought iron, steel, malleable iron, or other suitable metal, and while being more effective, in that greater uniformity of friction is obtained when applied, exceeds in life, or the duration of the shoe itself, that of the cast-iron shoe by over seventy-five per cent. Its extensive use on many of the most prominent roads in the country has proven its economy and superiority over any other shoe in use. All communications should be addressed to

THE CONGDON BRAKE-SHOE CO., 246 Clark St., Chicago
RAMAPO WHEEL AND FOUNDRY CO., Ramapo, N. Y.

or,

RAMAPO IRON WORKS

HILLBURN (Rockland County), NEW YORK.

MANUFACTURERS OF

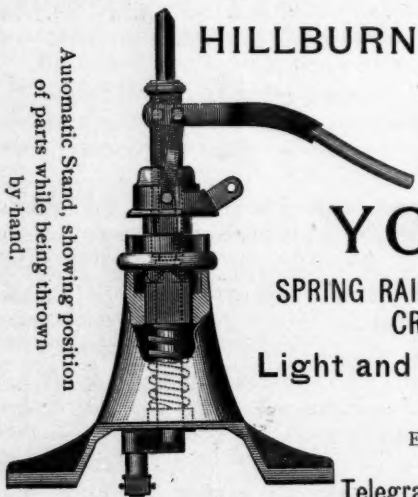
Switches, Automatic Safety Switch Stands, YOKED FROGS,

SPRING RAIL FROGS; also, BOLTED AND PLATE FROGS,
CROSSINGS OF EVERY DESCRIPTION,

Light and Heavy Castings and General Track
Equipment,

Estimates and Information cheerfully Furnished.

Telegraph Stations, RAMAPO, or SUFFERN, N. Y.



Automatic Stand, showing position
of parts while being thrown
by hand.



Automatic Stand, showing position
of parts while being thrown
Automatically by Train.

PHOTO-ELECTROTYPING

is a new process of Engraving, by means of which superior

Relief Plates, copper-faced, and ready for the printer, of any subjects: Landscapes, Portraits,
Buildings, etc., etc.,

can be obtained at about one-half the cost of Wood Engraving. We can work from photographs or drawings in pencil, ink
or wash.

Samples of our work can be seen in "Life," "Harper's Monthly," "Harper's Young People," "Century," and "St. Nicholas."

RAILROAD COMPANIES

and others who frequently invest largely in illustrations can save money and get the **BEST RESULTS**, by placing their
orders with the

FRANKLIN PHOTO-ELECTROTYPE COMPANY,

305 Pearl Street, New York City.

PATENTS.

THOMAS P. SIMPSON,
Patent Lawyer,
Formerly Examiner in Patent Office,
Metallurgic Class. Have prepared or revised more than 16,000 cases. Personally acquainted with all the Examiners. Terms moderate. Write for my Inventors' Guide.

Office, No. 12 Federal Building,
Opposite Patent Office,
WASHINGTON, D. C.

THE UNITED STATES

Rolling Stock Company,

GENERAL OFFICES—35 Broadway, N. Y.,
WORKS—Chicago, Ill., and Urbana, Ohio,

Offers for Lease to Railroads, Freight Lines, Mining
Companies and others,

Locomotive Engines and all kinds of Freight Cars

And is also prepared to build for Lease and

On Contract for Cash, or under the Car Trust System,
Such Rolling Stock of every description as
may be required.

A. HEGEWISCH, Pres't.

THE ROGERS

Locomotive and Machine Works,
PATERSON, N. J.

Having extensive facilities, we are now prepared to furnish promptly, of
the best and most approved descriptions, either

COAL OR WOOD BURNING

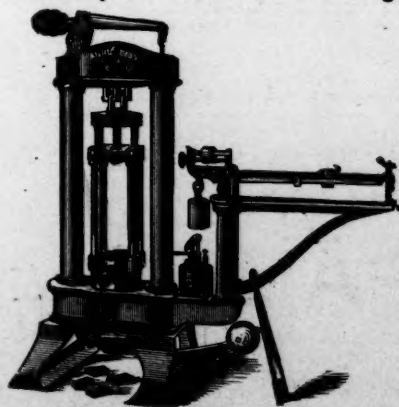
LOCOMOTIVE ENGINES,

AND OTHER VARIETIES OF

RAILROAD MACHINERY.

J. S. ROGERS, PRESIDENT,
J. S. HUGHES, SECRETARY,
WM. S. HUDSON, SUPERINTENDENT, } Paterson, N. J.
J. S. HUGHES, TREASURER,
44 Exchange Place, N. Y.

Established 1846.

Philadelphia Scale and Testing Machine Works.

RIEHLE BROS.,
MANUFACTURERS OF
Scales and Testing Machines
Of all capacities and descriptions. Sealed to
the standards of all Nations.
WAREHOUSES: 50 and 52 S. 4th St.,
OFFICE AND WORKS: 9th St., ab. Master,
PHILADELPHIA, PA.

PHELPS, DODGE & CO.,

IMPORTERS OF

Tin Plate, Sheet Iron, Copper, Block Tin,
Wire, etc.,

Cliff Street, between Fulton and John,
NEW YORK.

ESTERBROOK'S STEEL PENS.

Leading Numbers: 14, 048, 130, 333, 161.

FOR SALE BY ALL STATIONERS.

THE ESTERBROOK STEEL PEN CO.,
Works, Camden, N. J. 26 John St., New York

C. T. Raynolds & Co.

(Established in 1770.)

106 & 108 Fulton st.,
NEW YORK,

21 Lake st.,
CHICAGO,

COLOR MAKERS,

MANUFACTURERS OF

Fine Coach, Car and Railway Varnishes,
Carmines, Lakes, Vermilions,
White Lead, Zinc, etc.

Fine Brushes for Artists, Decorators, Coach,
Car, House and Sign Painters,
Artists' Materials, Decorative Tube Colors.

AGENTS FOR

Crockett's Preservative and Genuine Spar Composition.

F. W. Devoe & Co.,

Manufacturers of Fine

RAILWAY VARNISHES,

COACH AND CAR COLORS,

Ground in Oil and Japan,

ETC., ETC.

Fine Brushes adapted for railroad use. All kinds of Artists' Materials.
Colors for ready use, and all specialties for Railroad and Carriage purposes.

Railroad companies will save themselves great trouble in painting by allowing F. W. Devoe & Co. to prepare their Passenger and Freight Car Colors. This will insure Durability, Uniformity and Economy. F. W. Devoe & Co. manufacture from the crude materials which are the component parts of any shade, and they understand better their chemical relationship, when in combination, than can be possible to those who simply buy their dry materials and then grind them.

SEND FOR SAMPLE CARD OF TINTS.

Cor. Fulton and William Streets
NEW YORK.

Every Car Shop

Should have on file one or more copies of our new edition of

Studies in Scrolling, Striping and Ornamental Painting,

Illustrated with 290 Engravings.

Price, \$1, postpaid.

Address all orders to

"The American Railroad Journal,"

323 Pearl street, New York City.

Johnson Steel Street Rail Co.

JOHNSTOWN, PA.

Johnson's Patent Girder Rail.

WE FURNISH ALL APPENDAGES:

Rails, Curves, Crossings, Track Bolts, Frog Plates, Switches, Turn-table Guides, Joint Plates.

Descriptive Pamphlets and Circulars furnished if desired.



J. A. DEAN & CO.,

Manufacturers of

LINSEED OIL and

LINSEED CAKE,

181 Front Street, New York.

Waterbury Brass Co.,

No. 296 Broadway, New York.

Sheet, Roll and Platers' Brass.

MILLS AT WATERBURY, CONN.

New York & New England Railroad

TRANSFER STEAMER MARYLAND ROUTE.

Through Pullman Cars for

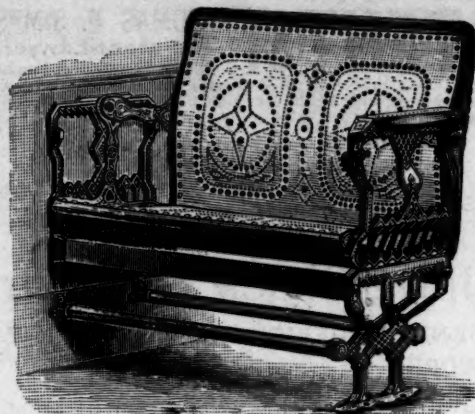
PHILADELPHIA, BALTIMORE AND WASHINGTON, WITHOUT CHANGE; connecting with through trains to FLORIDA and all points SOUTH and WEST. Trains leave Boston at 6.30 P.M., daily. Leave Boston for GRAND CENTRAL DEPOT, NEW YORK, at 10.00 A.M.; returning, leave New York at 11 A.M. and 11.35 P.M., week days. Pullman Palace Cars on night train.

THE NORWICH LINE between BOSTON and NEW YORK

Steamboat train leaves Boston 6.30 P.M., arrives at New London at 10.15 P.M., connecting with the new steamer CITY OF WORCESTER, Mondays, Wednesdays and Fridays, and CITY OF NEW YORK, Tuesdays, Thursdays and Saturdays. Returning, steamer leaves Pier 40, North River, New York, at 4.30 P.M., connecting at New London with train leaving at 4.05 A.M., arriving in Boston at 7.50 A.M. Good night's rest on the boat.

ASK FOR TICKETS VIA N. Y. AND N. E. R. R.

Office, 322 Washington street, Depot foot of Summer street, Boston.
A. C. KENDALL, Gen'l Pass. Agent.



GARDNER'S NEW REVERSIBLE CAR SEAT No. 8.

[Patented Dec. 6, 1881.]

As the back reverses, it raises the front of the seat so as to prevent the passenger from slipping off the seat, and removes the objection heretofore made to this kind of seat.

The large orders already received from the N. Y. C. and H. R. R. R. and other prominent Companies for our No. 8 Seat, is the best guarantee of its merit.

Made with Perforated Veneer, Leather, Plush, and Rattan Seats, which are interchangeable; one kind of seat can be used in the Summer, and the other in the Winter.

Please send for Descriptive Circular giving full particulars and prices.

GARDNER, HOLMES & CO.,

Successors to GARDNER & CO.,

Patentees and Manufacturers of

Car Seats, Car Ceilings, Depot Seats, etc.,

183 Canal St., NEW YORK.

Factory: 330 to 342 E. 61st Street.

Housatonic Railroad.

THE ONLY LINE RUNNING

THROUGH CARS

Between New-York, Great Barrington, Stockbridge, Lenox and Pittsfield—the far-famed resorts of the

BERKSHIRE HILLS

of Western Massachusetts—"Remarkable for pure air, romantic drives, and grand mountain scenery. Nature has truly expressed herself in wondrous beauty in the scenery of this region, containing perhaps, more of sublime enchantment than any other in New England."

Four through trains daily between New-York City and all points on the Housatonic Railroad, from the Grand Central Depot via New-York, New-Haven and Hartford Railroad, at 8 A. M. (Passenger), and 9 A. M. (Mixed); and 3.40 P. M. (Passenger), and 4 P. M. (Mixed). Sunday Passenger train leaves New-York at 6 A. M.

Descriptive Guide Book sent free by mail upon application to the General Ticket Agent.

H. D. AVERILL, Gen'l Ticket Agent.

W. H. YEOMANS, Superintendent.

General Offices, Bridgeport, Conn., Dec. 27, 1882.

AUG. W. WRIGHT,

Consulting Engineer for Horse Railroads.

Patent Tram-rail Joint Fastening.

A Trial Solicited.

SPECIFICATIONS FOR TRACKS, PAVING, ETC.

Correspondence Solicited.

Address care NORTH CHICAGO CITY RAILWAY, Chicago, Ill.

W. W. HANSCOM, Cable Tramway Engineer,

612 O'Farrell Street,

SAN FRANCISCO, CAL.